

BY MEADOW
GROVE & STREAM

N · INTRODUCTION
D · NATURE · STUDY

BY

HENRY · HILTON · BROWN.F.E.S.

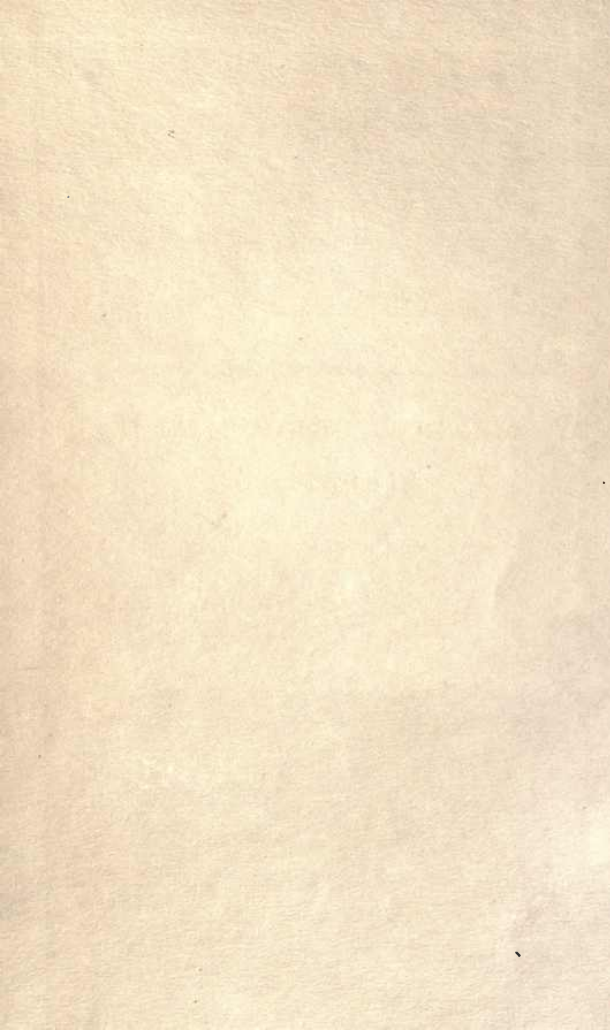




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W. Palmer

Wallace



BY MEADOW, GROVE AND
STREAM

*'There was a time when meadow, grove, and stream,
The earth, and every common sight,
To me did seem
Apparell'd in celestial light,
The glory and the freshness of a dream.*

* * * * *

*And, O ye fountains, meadows, hills, and groves,
Forebode not any severing of our loves !
Yet in my heart of hearts I feel your might ;
I only have relinquish'd one delight,
To live beneath your more habitual sway.'*

WORDSWORTH.



THE MEADOW BROOK.
From the painting by Frank Dickson.

By Meadow, Grove and Stream

AN INTRODUCTION TO NATURE STUDY

By
HENRY HILTON BROWN, F.E.S.

WITH OVER ONE HUNDRED AND SEVENTY FIGURES IN BLACK AND
WHITE FROM DRAWINGS BY THE AUTHOR

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PREFACE

ONE who proposes to add another volume to the large library of works on Nature Study, is expected to tender an apology for his proposal. I, therefore, offer the following list of special features of my little book in the hope that these will be accepted as justifying its publication:—

1. It treats of those objects which first attract the notice of a Rambler—trees, wild flowers, birds' eggs, beetles, grasshoppers, dragonflies, two-winged flies, sawflies, bees, butterflies, and moths.

2. Examples of each group have been specially and carefully selected, which are to be found in most parts of Britain, and may be used as types of large numbers of similar objects.

3. Each example is described as briefly as possible, only those points being specified which are likely to aid a beginner.

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4. A drawing in black and white has been made of each example, and where it is desirable to do so, the figures are arranged so that one plate gives a comprehensive view of its subject.

5. A scale for measurement of the figures has been furnished in those instances where size is important.

6. A list of books, useful in further study, with the prices, has been added at the end of each chapter.

7. Practical instructions are given for collecting and preserving the objects mentioned in the book.

Throughout I have sought to impress the oft-forgotten fact, that a naturalist is not a mere collector of specimens, but one who loves Nature, and observes her methods and operations. I have placed in an Introduction some graver thoughts on the subject, which might not appeal to all readers, and were on that account less suited for the body of the work, but which are too important to be omitted in a book of this sort.

H. H. B.

TABLE OF CONTENTS

CHAP.	PAGE
PREFACE	iii
LIST OF OBJECTS DESCRIBED	vii
INDEX TO PLATES	xiii
INTRODUCTION	17
I. NATURE STUDY	28
II. TREES	42
III. WILD FLOWERS	61
IV. BIRDS' EGGS	82
V. BEETLES, GRASSHOPPERS, ETC.	97
VI. DRAGONFLIES AND TWO-WINGED FLIES	116
VII. SAWFLIES AND BEES	131
VIII. BUTTERFLIES AND MOTHS	143
IX. NOTEBOOKS AND COLLECTIONS	167

LIST OF OBJECTS DESCRIBED

TREES. (CHAPTER II.)

	PAGE
European oak— <i>Quercus robur</i>	47
Holm oak— <i>Q. ilex</i>	48
Common elm— <i>Ulmus campestris</i>	48
Wych elm— <i>U. montana</i>	48
Beech— <i>Fagus sylvatica</i>	49
Ash— <i>Fraxinus excelsior</i>	50
Alder— <i>Alnus glutinosa</i>	51
Hornbeam— <i>Carpinus betulus</i>	51
Hazel— <i>Corylus avellana</i>	51
Birch— <i>Betula alba</i>	52
Dwarf birch— <i>B. nana</i>	52
Sycamore or Great maple— <i>Acer pseudo-platanus</i>	52
Spanish or sweet chestnut— <i>Castanea sativa</i>	53
Horse chestnut— <i>Æsculus hippocastanum</i>	53
Mountain ash or Rowan— <i>Pyrus aucuparia</i>	54
Field maple— <i>Acer campestre</i>	54
Lime or Linden— <i>Tilia europæa</i>	55
Walnut— <i>Juglans regia</i>	55
Scots fir or pine— <i>Pinus sylvestris</i>	56
Larch— <i>Larix europæa</i>	56
White willow— <i>Salix alba</i>	57
Saugh or Sallow— <i>S. caprea</i>	57
Osier— <i>S. viminalis</i>	57
White poplar— <i>Populus alba</i>	58
Black poplar— <i>P. nigra</i>	58
Aspen— <i>P. tremula</i>	58
Lombardy poplar— <i>P. fastigiata</i>	58

viii LIST OF OBJECTS DESCRIBED

WILD FLOWERS. (CHAPTER III.)

	PAGE
Daisy— <i>Bellis perennis</i>	65
Buttercup— <i>Ranunculus bulbosus</i>	65
Dandelion— <i>Taraxacum officinale</i>	65
Oxeye— <i>Chrysanthemum leucanthemum</i>	66
Corn marigold— <i>C. segetum</i>	66
Corn feverfew— <i>Matricaria inodora</i>	67
Blue-bottle or cornflower— <i>Centaurea cyanus</i>	67
Rose campion— <i>Lychnis dioica</i>	67
White campion— <i>L. vespertina</i>	67
Ragwort— <i>Senecio jacobæa</i>	68
Heartsease or Field pansy— <i>Viola tricolor</i>	68
Rest-harrow— <i>Ononis repens</i>	68
Scarlet pimpernel— <i>Anagallis arvensis</i>	69
Scarlet poppy— <i>Papaver rhæas</i>	69
Common fumitory— <i>Fumaria officinalis</i>	69
Ribwort plantain— <i>Plantago lanceolata</i>	70
Field Scorpion-grass— <i>Myosotis arvensis</i>	70
Meadow vetchling— <i>Lathyrus pratensis</i>	70
Sorrel— <i>Rumex acetosa</i>	71
Sheep's sorrel— <i>R. acetosella</i>	71
Harebell— <i>Campanula rotundifolia</i>	72
Germander speedwell— <i>Veronica chamædrys</i>	72
Sweetbriar rose— <i>Rosa eglanteria</i>	72
Dog rose— <i>R. canina</i>	72
Herb Robert— <i>Geranium robertianum</i>	73
Our Lady's Bedstraw— <i>Galium verum</i>	73
Bird's-foot trefoil— <i>Lotus corniculatus</i>	73
Wild strawberry— <i>Fragaria vesca</i>	74
Creeping cinquefoil— <i>Potentilla reptans</i>	74
Silver weed— <i>P. anserina</i>	74
Wood anemone— <i>Anemone nemorosa</i>	75
Wood sorrel— <i>Oxalis acetosella</i>	75
Wild hyacinth— <i>Endymion nutans</i>	76
Foxglove— <i>Digitalis purpurea</i>	76
Primrose— <i>Primula acaulis</i>	76
Scottish primrose— <i>P. scotica</i>	77
Sweet violet— <i>Viola odorata</i>	77
Dog violet— <i>V. canina</i>	77

LIST OF OBJECTS DESCRIBED ix

	PAGE
Lesser celandine— <i>Ranunculus ficaria</i>	77
Wood cranesbill— <i>Geranium sylvaticum</i>	78
Dovesfoot cranesbill— <i>G. molle</i>	78
Yellow tormentil— <i>Potentilla sylvestris</i>	78
Marsh marigold— <i>Caltha palustris</i>	78
Marsh forget-me-not— <i>Myosotis scorpioides</i>	79
Fine-leaved heath— <i>Erica cinerea</i>	79
Rock cistus— <i>Helianthemum chamæcistus</i>	79
Sea-pink or Thrift— <i>Statice maritima</i>	79
Wild Thyme— <i>Thymus serpyllum</i> and <i>T. chamædryas</i>	80

BIRDS' EGGS. (CHAPTER IV.)

Song thrush or Mavis— <i>Turdus musicus</i>	86
Blackbird— <i>T. merula</i>	87
Robin redbreast— <i>Erithacus rubecula</i>	87
Whinchat— <i>Pratincola rubetra</i>	87
Wren— <i>Troglodytes parvulus</i>	88
Blue titmouse— <i>Parus cæruleus</i>	88
Skylark— <i>Alauda arvensis</i>	88
Chaffinch— <i>Fringilla cælebs</i>	89
House sparrow— <i>Passer domesticus</i>	89
Yellowhammer— <i>Emberiza citrinella</i>	90
Greenfinch— <i>Ligurinus chloris</i>	90
Starling— <i>Sturnus vulgaris</i>	90
Sparrow hawk— <i>Accipiter nisus</i>	91
Lapwing— <i>Vanellus vulgaris</i>	93
Rook— <i>Corvus frugilegus</i>	93
Missel-thrush or Storm Cock— <i>Turdus viscivorus</i>	94
Hedge sparrow— <i>Accentor modularis</i>	94
Sedge warbler— <i>Acrocephalus phragmatis</i>	94
Meadow pipit— <i>Anthus pratensis</i>	95
Linnet— <i>Linota cannabina</i>	95
Swallow— <i>Hirundo rustica</i>	95

BEETLES. (CHAPTER V.)

(See also Appendix No. I. and Sheet I.)

Green Tiger-beetle— <i>Cicindela campestris</i>	100
Garden ground-beetle— <i>Carabus nemoralis</i>	101
Plunger beetle— <i>Dytiscus marginalis</i>	101

X- LIST OF OBJECTS DESCRIBED

	PAGE
Devil's coach-horse— <i>Ocypus olens</i>	102
Burying beetle— <i>Necrophorus ruspator</i>	102
Dor or Watchman— <i>Geotrupes stercorarius</i>	103
Common cockchafer— <i>Melolontha vulgaris</i>	103
Reddish skipjack— <i>Athous hæmorrhoidalis</i>	104
Churchyard beetle— <i>Blaps mucronata</i>	104
Silver-green weevil— <i>Phyllobius argentatus</i>	105
Double-barred longhorn— <i>Rhagium bifasciatum</i>	106
Sevenspot ladybird— <i>Coccinella septempunctata</i>	106

EARWIGS, COCKROACHES, AND GRASSHOPPERS.

(CHAPTER V.)

Common earwig— <i>Forficula auricularia</i>	108
Lesser earwig— <i>Labia minor</i>	109
Common Cockroach— <i>Blatta orientalis</i>	110
German cockroach— <i>Phyllodromia germanica</i>	111
Ship cockroach— <i>Periplaneta americana</i>	111
Australian cockroach— <i>P. australasiæ</i>	112
Parallel grasshopper— <i>Stenobothrus parallelus</i>	112
Green grasshopper— <i>S. viridulus</i>	112
Two-shade grasshopper— <i>S. bicolor</i>	112
Spotted grasshopper— <i>Gomphocerus maculatus</i>	112
<i>Pachytylus cinerascens</i>	113
Migratory locust— <i>P. migratorius</i>	113
Two-spot grasshopper— <i>Tettix bipunctatus</i>	113
Subulate grasshopper— <i>T. subulatus</i>	113

DRAGONFLIES. (CHAPTER VI.)

<i>Libellula quadrimaculata</i>	120
<i>L. depressa</i>	120
<i>Sympetrum scoticum</i>	121
<i>Cordulegaster annulatus</i>	121
<i>Æschna juncea</i>	121
<i>Æ. cyanea</i>	121
<i>Ischnura elegans</i>	122
<i>Enallagma cyathigerum</i>	122
<i>Pyrrhosoma nymphula</i>	122

TWO-WINGED FLIES. (CHAPTER VI.)

St. Mark's fly— <i>Bibio marci</i>	125
Piping gnat— <i>Culex pipiens</i>	125

LIST OF OBJECTS DESCRIBED xi

	PAGE
Herb crane-fly— <i>Tipula oleracea</i>	126
Yellow gadfly— <i>Tabanus sudeticus</i>	126
Common cleg— <i>Hæmatopota pluvialis</i>	127
<i>Leptis scolopacea</i>	127
Gooseberry hoverer— <i>Syrphus ribesii</i>	127
Transparent hoverer— <i>Volucella pellucens</i>	127
Drone fly— <i>Eristalis pertinax</i>	128
Rat-tailed maggot— <i>E. tenax</i>	128
Blue flesh-fly or Bluebottle— <i>Calliphora vomitoria</i>	128
House fly— <i>Musca domestica</i>	128
Bronze fly— <i>Gymnochæta viridis</i>	129
Dung fly— <i>Scatophaga stercoraria</i>	129

SAWFLIES AND SIRICES. (CHAPTER VII.)

<i>Perineura solitaria</i>	133
<i>Dolerus pratensis</i>	134
<i>Taxonus equiseti</i>	134
<i>Nematus septentrionalis</i>	134
<i>Nematus ribesii</i> —(Gooseberry sawfly)	134
<i>Cimbex femorata</i>	135
<i>Abia fasciata</i>	135
<i>Sirex gigas</i> —(Giant sirex)	136
<i>S. juvenicus</i> —(Pine sirex)	136

BEES. (CHAPTER VII.)

<i>Bombus terrestris</i>	137
<i>B. hortorum</i>	138
<i>B. latreillellus</i>	138
<i>B. lapidarius</i>	138
<i>B. lapponicus</i>	139
<i>B. pratorum</i>	139
<i>B. agrorum</i>	139
<i>B. venustus</i>	139
<i>B. smithianus</i>	140
<i>Psithyrus rupestris</i>	140
<i>Megachile centuncularis</i>	140
<i>Andrena albicans</i>	141

xii LIST OF OBJECTS DESCRIBED

BUTTERFLIES. (CHAPTER VIII.)

	PAGE
Large white— <i>Pieris brassicæ</i>	149
Small white— <i>P. rapæ</i>	149
Green-veined white— <i>P. napi</i>	149
Orange-tip— <i>Euchloë cardamines</i>	149
Clouded yellow— <i>Colias edusa</i>	150
Small tortoiseshell— <i>Vanessa urticæ</i>	151
Large tortoiseshell— <i>V. polychloros</i>	151
Red admiral— <i>Pyrameis atalanta</i>	152
Grayling— <i>Satyrus semele</i>	152
Meadow brown— <i>Epinephale janira</i>	153
Small copper— <i>Polyommatus phlæas</i>	154
Dark green fritillary— <i>Argynnis aglaia</i>	154
Pearl-bordered fritillary— <i>Brenthis euphrosyne</i>	155
Small pearl-bordered fritillary— <i>B. selene</i>	155
Scotch Argus— <i>Erebia æthiops</i>	156
Large heath— <i>Cænonympha typhon</i>	157
Small heath— <i>C. pamphilus</i>	157
Common blue— <i>Lycæna icarus</i>	157
Green hairstreak— <i>Callophrys rubi</i>	157

MOTHS. (CHAPTER VIII.)

Death's-head— <i>Acherontia atropos</i>	158
Tiger— <i>Arctia caia</i>	159
Clouded buff— <i>Nemeophila russula</i>	160
Wood tiger— <i>N. plantaginis</i>	160
Ruby tiger— <i>Phragmatobia fuliginosa</i>	160
White ermine— <i>Spilosoma menthastri</i>	161
Silk— <i>Bombyx mori</i>	161
Buff ermine— <i>S. lubricipeda</i>	161
Emperor— <i>Saturnia pavonia</i>	161
Oak eggar— <i>Lasiocampa quercus</i>	162
Vapourer— <i>Orgyia antiqua</i>	163
Puss— <i>Dicranura vinula</i>	164
Kentish glory— <i>Endromis versicolora</i>	164

INDEX TO PLATES

PLATE I. LEAVES OF TREES.

	PAGE		PAGE
1. Oak	47	8. Birch	52
2. Elm	48	9. Sycamore	52
3. Beech	49	10. Spanish Chestnut . .	53
4. Ash	50	11. Horse Chestnut . .	53
5. Alder	51	12. Rowan or Mountain	
6. Hornbeam . . .	51	Ash	54
7. Hazel	51		

PLATE II. LEAVES OF TREES.

1. Field Maple . . .	54	7. White Willow . . .	57
2. Lime	55	8. Saugh or Sallow . .	57
3. Walnut	55	9. Osier	57
4. Dwarf Birch . . .	52	10. White Poplar . . .	58
5. Scots Fir	56	11. Black Poplar . . .	58
6. Larch	56	12. Aspen	58

PLATE III. WILD-FLOWERS.

1. Oxeye	66	7. Wood Anemone . . .	75
2. Corn-flower . . .	67	8. Wood Sorrel . . .	75
3. Rose Campion . . .	67	9. Wild Hyacinth . . .	76
4. Ragwort	68	10. Tormentil	78
5. Heartsease . . .	68	11. Foxglove (reduced) .	76
6. Rest-harrow . . .	68	12. Harebell	72

PLATE IV. WILD-FLOWERS.

	PAGE		PAGE
1. Primrose . . .	76	7. Germander Speedwell .	72
2. Sweet Violet . .	77	8. Scarlet Pimpernel . .	69
3. Lesser Celandine . .	77	9. Herb Robert . . .	73
4. Wood Cranesbill . .	78	10. Fumitory . . .	69
5. Sweetbriar Rose . .	72	11. Bedstraw . . .	73
6. Marsh Marigold . .	78	12. Ribwort Plantain . .	70

PLATE V. WILD-FLOWERS.

1. Bird'sfoot Trefoil . .	73	7. Meadow Vetchling . .	70
2. Wild Strawberry . .	74	8. Creeping Cinquefoil . .	74
3. Marsh Forget-me-not. .	78	9. Rock Cistus . . .	79
4. Corn Feverfew . . .	67	10. Sea Pink or Thrift . .	79
5. Corn Marigold . . .	66	11. Wild Thyme . . .	80
6. Fine-leaved Heath . .	79	12. Sorrel . . .	71

PLATE VI. BIRDS' EGGS.

1. Song Thrush . . .	86	7. Skylark . . .	88
2. Blackbird . . .	87	8. Chaffinch . . .	89
3. Redbreast . . .	87	9. House Sparrow . . .	89
4. Whinchat . . .	87	10. Yellowhammer . . .	90
5. Wren . . .	88	11. Greenfinch . . .	90
6. Blue Titmouse . . .	88	12. Starling . . .	90

PLATE VII. BIRDS' EGGS.

1. Sparrow Hawk . . .	91	6. Sedge Warbler . . .	94
2. Lapwing . . .	93	7. Meadow Pipit . . .	95
3. Rook . . .	93	8. Linnet . . .	95
4. Missel-thrush . . .	94	9. Swallow . . .	95
5. Hedge Sparrow . . .	94		

PLATE VIII. BEETLES.

1. Green Tiger-beetle . .	100	8. Reddish Skipjack . .	104
2. Garden Ground-beetle .	101	9. Churchyard Beetle . .	104
3. Plunger Beetle . . .	101	10. Silvergreen Weevil . .	105
4. Devil's Coach-horse . .	102	11. Double-barred Long- horn . . .	106
5. Burying Beetle . . .	102	12. Sevenspot Ladybird .	106
6. Dor Beetle . . .	103		
7. Cockchafer . . .	103		

PLATE IX. GRASSHOPPERS, ETC.

	PAGE		PAGE
1. Lesser Earwig . . .	109	6. Parallel Grasshopper .	112
2. Common Earwig . . .	108	7. Ditto (female) . . .	112
3. Common Cockroach (male)	110	8. Two-spot Grasshopper	113
4. Common Cockroach (female)	110	9. Spotted Grasshopper .	112
5. German Cockroach . .	111	10. Migratory Locust . .	113
		11. <i>Pachytylus cinera-</i> <i>scens</i>	113

PLATE X. DRAGONFLIES.

1. <i>Libellula quadrimacu-</i> <i>lata</i>	120	5. <i>Ischnura elegans</i> . .	122
2. <i>Sympetrum scoticum</i>	121	6. <i>Enallagma cyathige-</i> <i>rum</i>	122
3. <i>Cordulegaster annula-</i> <i>tus</i>	121	7. <i>Pyrrhosoma nymph-</i> <i>ula</i>	122
4. <i>Æschna juncea</i> . . .	121		

PLATE XI. TWO-WINGED FLIES.

1. St. Mark's Fly . . .	125	7. Gooseberry Hoverer .	127
2. Gnat (magnified) . .	125	8. Transparent Hoverer .	127
3. Herb Crane-fly (re-		9. <i>Eristalis pertinax</i> . .	128
duced)	126	10. Bluebottle	128
4. Yellow Gadfly . . .	126	11. Bronze Fly	129
5. Common Cleg	126	12. Dung Fly	129
6. <i>Leptis scolopacea</i> . .	127		

PLATE XII. SAWFLIES AND SIRICES.

1. <i>Perineura solitaria</i> . .	133	5. <i>Nematus ribesii</i> . . .	134
2. <i>Dolerus pratensis</i> . .	134	6. <i>Cimbex femorata</i> . . .	135
3. <i>Taxonus equiseti</i> . . .	134	7. <i>Abia fasciata</i>	135
4. <i>Nematus septentrion-</i> <i>alis</i>	134	8. <i>Sirex gigas</i>	136
		9. <i>Sirex juvencus</i>	136

INDEX TO PLATES

PLATE XIII. BEES.

	PAGE		PAGE
1. <i>Bombus terrestris</i>	. 137	8. <i>Bombus venustus</i>	. 139
2. <i>Bombus hortorum</i>	. 138	9. <i>Bombus smithianus</i>	. 140
3. <i>Bombus latreillellus</i>	. 138	10. <i>Psithyrus rupestris</i>	. 140
4. <i>Bombus lapidarius</i>	. 138	11. <i>Megachile centuncularis</i>	. 140
5. <i>Bombus lapponicus</i>	. 139	12. <i>Andrena albicans</i>	. 141
6. <i>Bombus pratorum</i>	. 139		
7. <i>Bombus agrorum</i>	. 139		

PLATE XIV. BUTTERFLIES.

1. Large White	. . 149	4. Orange-tip	. . 149
2. Small White	. . 149	5. Clouded yellow	. . 150
3. Green-veined White	. 149		

PLATE XV. BUTTERFLIES.

1. Small Tortoiseshell	. 150	4. Meadow Brown	. 153
2. Red Admiral	. . 151	5. Small Copper	. . 154
3. Grayling	. . . 152		

*PLATE XVI. BUTTERFLIES.

1. Dark Green Fritillary	. . . 154	4. Pearl-bordered Fritillary (closed)	. . 155
2. Pearl-bordered Fritillary	. . . 155	5. Scotch Argus	. . 156
3. Small Pearl-bordered (closed)	. . . 155	6. Large Heath	. . 157
		7. Small Heath	. . 157
		8. Green Hairstreak	. 157

PLATE XVII. MOTHS.

1. Tiger	. . . 159	4. Wood Tiger	. . 160
2. Ditto (larva)	. . . 159	5. Ruby Tiger	. . 160
3. Clouded Buff	. . . 160	6. White Ermine	. . 161

PLATE XVIII. MOTHS.

1. Emperor	. . . 161	4. Puss	. . . 164
2. Oak Eggar	. . . 162	5. Kentish Glory	. . 164
3. Vapourer	. . . 163		

BY MEADOW, GROVE AND STREAM

INTRODUCTION

ON a bright day in the early summer of last year, I was exploring a narrow glen in the Southern Ochils. It was little more than a cleft, separating two spurs of the hills, between which it ran inwards and upwards for nearly a mile. A mountain stream dashed down it in headlong and impetuous course, and a well-made footpath wound up it into the heart of the range. It is a circumstance connected with this path that has led me to mention the valley in this place.

About halfway up the glen, the stream was joined by another from the right bank. At this point the footpath divided. One portion held upwards through a delightful environment of golden-green oak, silver birch

and fern-like rowan, all in the fresh foliage of the season. Many wild-flowers gleamed among the grass, and numerous birds sang sweetly in the branches. The other portion held downwards, passing over a bridge, and followed the channel of the second stream through a pass in the damp, dark rock, only a few yards in width. The sunshine seldom reached it, and in consequence the place was chilly on the hottest day. Here were no pleasant surroundings. Gloomy rocks replaced the graceful foliage, and granite chips the gay flowers. There were no bird-songs. The water, which gleamed in the sunlight beside the one path, ran in darkness beside the other. Both routes attained the same goal—the free air and light on the mountain above—but they led through almost opposite conditions during this part of their course.

I am now far away from the Ochils, but the memory of these two paths has come back to me, and has suggested an analogy which may form an appropriate introduction to this little book. As there were two routes to the hills, passing through the glen, a higher and a lower, so there are two ways of approaching

the study of Nature, a superior and an inferior. It is in our option to choose either the one or the other, but, like the Ochil paths, our experiences in each will be very different. It is, therefore, proper that we should consider well before we make a selection.

We may choose, on the one hand, to regard Nature as being exclusively an exhibition of the operations of natural law, taking Science for our sole guide and counsellor. If we do so, we shall find that, although she has stored up many curious and wonderful facts, and has made many strange and instructive discoveries, Science is, nevertheless, a cold and formal instructress. She is not even omniscient, for there is no course of investigation, which we can follow in her company, where she does not soon reach a closed door, of which she cannot find the key. 'I do not know,' is the constant reply of the honest scientist. We shall certainly make progress in knowledge, but our journey will be cold and cheerless. It will be not without deep interest, and not without abundant food for thought, but it will have little to stimulate hope, and less to rouse our drooping spirits.

It will appeal to the head rather than to the heart.

We may, on the other hand, choose to regard Nature as being a revelation of a personal God, and of His goodness, love, and power. The Psalmist, in the text which I have placed on my title-page, seems to have had in view the mental processes by which men are led thus to contemplate creation. They look upon all created things as the works of the Lord ; they see that these works are great ; they take pleasure in them ; they seek to know them. Nature, in this way, becomes to us not only a curious and entertaining study, but a volume in which our Heavenly Father has written for our instruction a revelation of Himself, second only in importance and precision to that which He has given us in the Bible.

If, then, we take God's Word for our guide, and Science as our companion, we shall see in each operation of Nature an expression of the will of the Creator, and, while we advance in knowledge as certainly and rapidly as by the other way, our journey is cheered and our steps encouraged by a hopefulness and

brightness, which were entirely absent from that method of study.

To complete the analogy, I may point out that both methods of study will, no doubt, under God's providence, ultimately lead to a knowledge of the truth, just as both paths in the Ochils led to the light and air of the mountain-side ; but the routes differ in many respects. Nature study, enlightened by the divine revelation, differs as greatly from Nature study, enlightened only by the rays of Science, as the path amidst trees, flowers, and brightness differed from that amidst rock, stones, and gloom. And the lower way will only attain the truth by *turning upwards* to join the higher way.

I trust that no one will be so unjust as to twist my words into a minimizing of the results of scientific investigation, or a denial of the right of men to study the mysteries of the material creation. I have been a humble student of Science and observer of Nature for over thirty years. I should be sorry to think, and certainly do not think, that the time I have devoted to these pursuits has been wasted. Nature study has been to me a

source of pure and genuine pleasure, and a solace in periods of trouble and vexation. But I ask students of Nature to conduct their studies with reverence and humility; with reverence, by remembering the Creator when they are studying the creation; and with humility, by remembering the past history of science, when they are tempted to make dogmatic assertions. Most of the theories of only a century ago are either modified or exploded to-day, and many of the 'fairy tales of science,' of that date, are now regarded as fairy tales indeed.

I make my request with more confidence from the fact that the best and most enduring work has been done by naturalists, who have conducted their researches in the spirit I desiderate. The Creator, who made man and his surroundings, implanted in his mind faculties of perception, comparison, analysis, and judgment. The scientist, who applies these faculties to the observation and study of Nature, is both exercising a right and fulfilling a duty, so long as he keeps within the bounds of humility and reverence. *Scientia* means 'knowledge,' but not necessarily 'fulness

of knowledge.' The true scientist is aware of his limitations, preserves an open mind, and is equally willing to learn the true or to unlearn the false.

It is thus not only an amusement, but a duty, in our rambles afield, to exercise our powers of observation, and to reflect intelligently upon what we see and hear. If we do this in the right way, we cannot fail to be struck with the fact that unmistakable traces of design exist in all parts of Nature. Things are perfectly adapted to the purposes which they have to serve. This will be seen, not only in adaptation to environment, which might possibly be the effect of development under some natural law, but also in adaptation of structure, which could not conceivably be self-produced. These indications have been recognized for a long period, and furnish the materials out of which theologians have built that famous proof of the existence of a God, which is familiarly called the 'argument from design.' One of the most exhaustive, and certainly the most eloquent, exposition of this argument is that of Dr. Paley, in his *Natural Theology*. He sums it up in these

memorable words: 'The marks of design are too strong to be gotten over. Design must have had a designer. That designer must have been a person. That person is God.'

In our days there is much talk about Nature study. Educational authorities are urging the propriety of children being taught to observe and note the facts of natural history as exhibited in the districts where they dwell. I highly approve of both children and adults being encouraged to devote more attention to these facts, but I cannot shut my eyes to two grave dangers which may result from zeal in such work, not tempered with discretion. The first and least of those dangers is the risk that if we set children in every part of Great Britain to collect specimens of animals and plants, without careful direction, many rare species of both will be exterminated. This is a very real peril, and has attracted the attention of scientific societies. The remedy must be sought in thorough instruction as to the sanctity of life, and the superiority of observing over collecting, as a means of acquiring knowledge.

The second and greater risk is that we teach materialism, and, while impressing upon young people the beauty and interest of their surroundings, point only to natural causes. This danger is to be combated by taking care that Nature study shall be pursued under a sure conviction that Nature is but one part of the divine revelation, and has to be studied along with the other part, which is contained in the Bible. We ought to bear in mind the analogy which I founded on the two paths in the Ochils, and follow that way which leads *upwards*, in the sunshine, amidst verdant trees and many-hued flowers.

In the succeeding chapters of this book I have sought, so far as I was able, to guard against the first of these dangers. I have again and again impressed upon the lover of Nature that it is better, and generally more profitable to himself, to observe and note natural phenomena, than to make collections of dead and dried specimens; that the sanctity of life, in its lower not less than in its higher forms, has to be respected; and that, where a collection must be made for

purposes of study, it is improper to needlessly multiply specimens of individual species. These lessons, if taken to heart in the way every true naturalist should do, ought to prevent those who read them from indulging in a wholesale destruction of plants or animals. I did not, however, feel at liberty, in the pages of the volume itself, to introduce questions of religion, as safeguards against the second and graver danger, to which allusion has been made. I did not deem those pages a suitable place for such remarks; but I hope that the Introduction, defective as I know it is, may be accepted as a sincere effort to supply what is lacking in the text under this head.

With these explanations, and this parting aspiration, I leave my readers to pursue the study of Nature, each in his own way, finally commending it to them in the words of the Reverend John Richard Vernon, Prebendary of Wells, who was himself a most careful and loving student of Nature, and a most accomplished interpreter of her parables. The words will be found in the Introduction to *The Last Load Home*, a work of his mature

experience : ' Fashions in literature come and go ; questions rise and are answered, or, it may be, are wisely relegated for answer to the great day of the coming of the Master ; tastes alter, and methods of teaching change ; yet Nature remains unaltered, and her fields will still bear harvests for reapers, and furnish grain for gleaners. Still there will be found ever new interest in the " parables of Nature," and " earth's many voices " will still have lore profound and sweet to the child-heart and to the poet-mind.'

CHAPTER I

NATURE STUDY

‘**N**ATURE,’ says Carlyle, ‘is a volume written in celestial hieroglyphs, in the true Sacred-writing; of which even Prophets are happy that they can read here a line and there a line.’ A similar thing was said, long before his time, in a little book called, *Some Fruits of Solitude*, attributed to the founder of Pennsylvania: ‘The world is certainly a great and stately volume of natural history, and may be not improperly styled the hieroglyphics of a better. But, alas, how very few leaves of it do we seriously turn over.’

The one writer complains of the difficulty of reading; the other of the indifference of the readers. Might we not turn over the leaves of the Book of Nature more frequently, and with greater profit to ourselves and

others, if we had the key to the hieroglyphs, and some knowledge of the Sacred-writing? When the subject of a volume is a mystery, and the greater part of it is written in an unknown tongue, what advantage do we derive by listlessly turning over its leaves? Why should we expect the Book of Nature to be different? Is it reasonable to ask men to take an interest in what they do not understand? While Nature is absolutely strange to us, we take little pleasure in its parables, its lessons, or even its beauties.

Apart from this, observations have no value, if we are unable to attach names to what we have seen. A child, when he is attracted by anything of which he does not know the name, invents one for himself. He feels the necessity for giving names to things. When our senses bring to our notice an external object, and our reason tells us that it differs from anything we have seen before, the perception is only impressed upon our memory if we attach some title to the thing observed, by which we may know it again. We perceive thousands of objects, which pass away and leave no

impression upon our mind because of our failure to give them names. If we observe that a certain tree is infested by some insect unknown to us, and we note, 'Observed a tree infested by a green insect,' what value has such a note for ourselves, or any other person? But if we can name the tree, and still more if we can name the insect, our observation may be extremely useful.

It is my design in this book to enable the reader to *give names to things*. Information about those things is added, but the first object I have set before me is to assist in identifying and naming some of the objects which form illustrations in the Book of Nature. I introduce the reader to a number of plants and animals, which he ought to know at the outset of his study of Nature. They are but a handful compared with the endless variety of known species, and still more insignificant if we consider the vast number which are probably unknown to science, and yet they include a large part of those which will catch his eye in his first rambles afield.

Two facts are remarkable in Nature study

—the comparatively small number of objects which are observed by the untrained eye, and the rapidity with which forms seem to multiply, as we direct our attention to searching for them. There are few parts of the British Isles in which less than a score of different butterflies are to be seen at one season or another, and yet, when visiting a fresh locality, I have been told by intelligent residents that there were *only two or three* in their neighbourhood. Their eyes were unaccustomed to distinguish, and they saw no difference in the butterflies unless they were of distinct hues—white, brown, or blue.

The true way to begin Nature study is to go afield with notebook and collecting-boxes; to observe as many and as varied objects as you can; to learn to name what you see; to recollect facts which you observe; and to verify and extend your observations by a perusal of books, which have been written by other observers who have preceded you. It is my desire to aid you in forming the habit of observation, in making the necessary collections, and in naming your first specimens.

When you have done this, I refer you to the books named in the list at the end of each chapter. These lists do not pretend to be complete, neither do I profess that the books chosen are necessarily the best. They are books which I have myself found useful, and I have selected works at various prices, in order that each reader may supply himself according to the measure of his purse. By this method, what the reader sees and notes will be stored up in his memory, and he will acquire, almost without effort, a familiarity with the pages of the Book of Nature which will lead him to the hidden mysteries of the hieroglyph, if his inclination and perseverance carry him so far.

It must not be concealed that the subject, in its present condition, is an immense one. A complete knowledge of it is unattainable by a single person. There was once a time when a man might claim that he knew all natural history, without being set down by his hearers as a liar. One brain could then comprehend everything that was known about animals, plants, and minerals.

That time has gone for ever. No one dare

now profess a thorough knowledge of more than part of the subject, and that often a comparatively limited section. A humorous, yet truthful, statement of this fact occurs in *The Poet at the Breakfast Table*. The poet was seated next a man whose profession or occupation he was unable to guess. A chance remark showed that he was interested in insects, and the poet asked whether he was an entomologist. The answer was emphatic and unexpected, 'Not quite so ambitious as that, sir. I should like to put my eyes on the individual entitled to that name! A society may call itself an Entomological Society, but the man who arrogates such a broad title as that to himself, in the present state of science, is a pretender, a dilettante, an impostor!' Asked what was his proper title, he replied that he was sometimes called a 'coleopterist,' but 'scarabeeist' was the description he claimed. His life's work was confined to the genus *Scarabæus*, and he was content to let his reputation rest upon his labours in that single division of the beetles. There are many men to-day, whose field of study is even more limited than this.

The subject has been vastly extended since Dr. Holmes wrote *The Poet at the Breakfast Table*. To take a single instance, there are now known to science about a quarter of a million of insects. As that number conveys no distinct meaning, I shall express the idea in another form. It is reasonable to suppose that ten insects might be described upon one page. An account of 250,000 would, in that case, occupy 25,000 pages. These pages, bound in books of 500 each, would make fifty large volumes. This would be a huge work, and yet it would contain nothing but description of the baldest character, would omit all notice of classification, habits, instincts, and the other matters which impart life and interest to the study, and would deal with only one group of animals!

The immensity of the subject compels specialization, but there is danger in carrying this process too far. The specialist is apt to lose all sense of proportion, and to assign to the subject upon which he is engaged an importance which it does not deserve. There is also the risk that, recognizing the impossibility of one man comprehending all that is

known about natural history, we may overlook the necessity for the student acquiring a general acquaintance with the relations of the several portions of the subject. The scientist can afford to devote his attention to one branch, and to become a specialist in it, but the ordinary student of Nature must aim at the acquisition of at least a moderate knowledge of the main divisions.

Strictly speaking, natural history comprehends all the sciences which treat of animals, vegetables, and minerals, but the student at the outset may confine his attention to the first two groups. These comprehend a great variety of forms—beasts, birds, reptiles and fishes; insects, spiders, shellfish, worms, and lower organisms; flowers, shrubs, and trees; mosses, ferns, fungi, and seaweeds. Those forms have been arranged in a definite sequence—in sub-kingdoms, classes, orders, families and genera; but no perfect system has yet been devised, and there is much diversity of opinion among experts.

When we try to define the system of Nature, we are like men set to put together a huge dissected puzzle, the parts of which

have been thrown into a stream, and carried by the current into a wide lake. The men who are trying to reconstruct the puzzle, do not recover all the pieces at once ; some parts have been lost in their passage to the lake ; others are chipped and altered. These difficulties render the reconstruction of the puzzle an almost impossible task, and so it is in arranging plants and animals. We do not yet know all the species in existence ; some have died out ; others have probably modified their specific characters in the lapse of ages. The consequence is that we have to work with tentative schemes of classification, full of anomalies and exceptions, and liable to constant alteration as our knowledge extends. Such as they are, however, they are indispensable, if we wish to thread our way through the maze of forms which exist in various parts of the globe.

Much may be learned, and, indeed, must be learned, from books ; but personal observation is at once the most agreeable and the surest mode of acquiring a knowledge of plants and animals. In the course of a few

rambles afield, using one's eyes and ears, and prepared by some general introduction to perceive intelligently what is passing around one, acquaintance with Nature grows rapidly and pleasantly.

One soon learns to distinguish ordinary objects, and each step which is gained leads to the knowledge of other things. The store of information increases in a sort of arithmetical progression. Each person will naturally adopt the manner of observation which best suits himself, but I shall, in this place, give one example, partly for the sake of showing how to set about the work, but more particularly for the sake of illustrating the distinction between several large groups of living creatures, which, perhaps more frequently than any others, are likely to come in the way of the observer.

Let us suppose that we are walking in a country lane, and stop to raise a flat stone in a cool, damp, moss-grown corner. Suppose further, as is probable, that four creatures are disturbed by our action—a woodlouse (called a 'slater'), a spider, a centipede, and an earwig. They are not superficially attractive

creatures, but that does not affect our purpose. We should no doubt remark that a great variety of insects had harboured under that stone, but this remark would be incorrect. There would be only one insect among them—the earwig. What makes the combination interesting is that each of those little creatures represents a whole class.

Proceeding to examine them in detail, and directing our attention to the general construction of their bodies and the character of their organs of locomotion, we see that, while they have much in common, they have many points of difference. We might tabulate our observations thus:—

(1) The *woodlouse* has no distinct separation of the body into head, thorax, and abdomen, has fourteen legs, and no wings.

(2) The *spider* has the head and thorax in one piece, clearly separated from the abdomen, has eight legs, and no wings.

(3) The *centipede* has a distinct head, and the rest of the body composed of nearly equal divisions, has thirty legs, and no wings.

(4) The *earwig* has a distinct separation of the body into head, thorax, and abdomen,

has six legs, and four wings, the upper pair forming a cover to the lower pair.

These points are sufficient, in a broad and general way, to assign the creatures to their respective classes—the woodlouse to the *Crustacea*, the spider to the *Arachnida*, the centipede to the *Myriapoda*, and the earwig to the *Insecta*. In such observations, and most others which the beginner will make, there is nothing new. Everything he notes at first will have been already noted by some one else; but to himself his own observations will have the force of novelty, and when he reads the notes of others, he will appreciate and remember better what they say, in respect that he has witnessed the facts for himself.

Rambles afield! What a pleasant train of thought is suggested by these words to a dweller amid arid streets, who has at a former period resided in the country! His mind is carried back to scenes once familiar, but now difficult to recall. He roves in imagination over a chess-board of fields, in which the squares are not black and white, but green of many shades, chequered with white, yellow, blue, and scarlet; or by the sides of rivers,

where the tall willow-herb raises its pink spikes, and the flags and lilies sway in the current, while the water-hens struggle to hide themselves in the green recesses; or through woods under the arched branches of beeches and oaks, and the more sombre foliage of pines and firs rising out of deep heather; or on mountains, clothed to the summit with heather and granite chips, or a pastoral covering of verdant grass. If the appreciation of these beauties is not inborn it certainly needs little training to acquire some measure of it; but the beauty and pleasantness cannot be fully comprehended unless one is able to name a few at least of the plants and animals which impart variety to the scene, and to associate with them some facts respecting their nature or uses.

Such knowledge adds greatly to our interest when we visit for the first time a region at a distance from our home. We are then enabled not merely to admire the change of scenery and environment, but to compare intelligently the trees and flowers, birds and insects, of the place at which we

have arrived, with those of the district we have left. Without such knowledge we should perceive in many cases little difference between them, although there really was a wide divergence, and we should miss a constant source of amusement and instruction.

These are some of the fruits of Nature study. There is a gain, deeper and more important than any of them, which, as I have discussed it at some length in the Introduction to this book, I shall here merely indicate, and leave it to the meditation of my thoughtful readers. The student of Nature, who approaches the study in an attentive and observant spirit, will increase daily in knowledge and reverence. He will learn more and more of the minute detail and perfection of structure which exist in parts of the creation hitherto deemed by him unimportant, or even repulsive, and he will in time be able to repeat with comprehension the words of St. Augustine, *Deus magnus in maximis, maximus in minimis*: God is great in the very big things, but greatest in the very little.

CHAPTER II

TREES

I HAVE chosen trees as my first subject, because they are prominent objects in almost every place. In rambles afield and in rambles citywards, trees are features of the scene which at once attract our notice. Indeed, owing to the general desire for public parks in towns, and the strict preservation of game in counties, it is usually easier for inhabitants of the former than for dwellers in the latter, to acquire a knowledge of the various sorts of trees.

All our lifetime these beautiful creations are more or less about us, and intimately associated with us. In youth, it is our delight to climb them and to swing upon their branches; in after years our esteem is as warm, if its source is less athletic. We

are fond of them for their beauty and their associations. They give the earliest indication of the waxing, as well as of the waning, of the year. A faint and delicately green efflorescence, spreading over the copse, assures us of the reviving spring—the return of Persephone from Dis; an auburn flush, tinging the woodlands, heralds the chilly approach of winter—the recall of Persephone to her dismal home.

‘Come, my beloved, let us go forth into the field; let us lodge in the villages. Let us get up early to the vineyards; let us see if the vine flourish, whether the tender grape appear, and the pomegranates bud forth.’ One cannot hear this passage without being reminded of the regularity with which the trees announce the changes of the seasons. We ought, however, to remember that the whole panorama of the reviving year, with its beauty and gladness, is a pleasure we owe to our temperate climate. Dwellers in the tropics do not enjoy it to the same extent. No winter desolation there overtakes the forests, and therefore no spring joy ensues; here, the reclothing of the trees

forms a large part of the loveliness of the springtime. It is pleasant to watch the green covering spread over the bare woodlands, and to note how each kind of tree has its fixed period and manner of leafing. Then, as time passes, the leafy canopy grows denser. At first, the fresh, tender leaves permit the sunlight to filter through with little diminution of its brightness. The air beneath the trees, is, on a sunny day, full of gold. As the green deepens, and the leaves are rendered opaque by dust, the screen becomes impervious. The wood is then

‘ . . . a pillar’d shade
High overarch’d, and echoing walls between.’

So it continues throughout the summer, and well into the autumn. Gradually the thickening and withering process proceeds. More or less of russet, brown, orange, even scarlet, shows among the foliage. At length a keen frost chills the last spark of vitality, and all is ready for the closing scene. As Hood quaintly sings—

‘ Boughs are daily rifled by the gusty thieves,
And the book of Nature getteth short of leaves.’

Steadily the stripping process goes on, until the violent gales after the equinox finish the work, and leave the wood 'pillared' indeed, but a 'shade' no more.

Trees are not often mentioned in proverbial wisdom. The Irish have a saying that there is no tree but has rotten wood enough to burn it—reminding us of the smouldering fire of evil propensities within us; and the Scots have another to the effect that 'it's a gude tree that has neither knap nor gaw,'—the meaning of which proverb is somewhat similar. Then we have Pope's well-worn couplet—

'Tis education forms the common mind:
Just as the twig is bent the tree's inclined.'

neither of which propositions is invariably true. Although somewhat neglected in proverbs, trees have not been overlooked by those who directed the beginnings of superstition. In ancient times woods were the temples of infant religions. In many passages of Scripture we are told of 'groves' which were the scene of idolatrous rites. Even particular trees were sacred to special divinities. Thus, Jupiter claimed the

oak; Venus the myrtle; Apollo the laurel; Cybele the pine; Hercules the poplar; Bacchus the ivy and vine. There is probably no lover of sylvan glades who has not felt how natural is the association between visible trees and invisible dryads. The imagination readily peoples a wood with unseen beings.

Passing now to more practical matters, I ask, what do we understand by a 'tree'? I answer that when we speak of a 'tree,' we mean a plant which attains a height of not less than twenty feet, and has a stem which is composed of permanent wood. Trees vary greatly in general shape, in the trend of their branches, and in the character of their leaves, flowers, and fruit. Many have a distinct *facies*, so that one can recognize them afar off. Conifers may be distinguished from hardwoods at a distance of miles. The most convenient means of identification, however, will be found in the stem, leaves, and fruit. In the plates of this book, only the leaves will be drawn, and it is right to observe that, although most of these have been drawn as nearly to the natural size as possible, it has



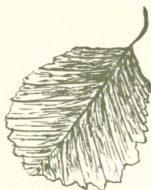
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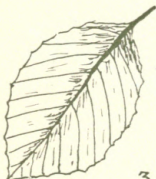
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11.



9.



12.

7. Hazel. 8. Birch. 9. Sycamore. 10. Spanish Chestnut.
11. Horse Chestnut. 12. Rowan, or Mountain Ash.

been necessary to reduce some of them, otherwise I should have had to be content with fewer examples.

Having now spoken of trees in general, I shall proceed to consider the individual species mentioned in the plates.

First of these is the European Oak (*Quercus robur*) Plate I., Fig. 1—‘sole king of forests all,’ as Spenser calls it. Thick, rough bark, egg-shaped acorns, and leaves with an irregular outline, like a map of an indented sea-coast, clearly distinguish this tree from all others. There are three main varieties of the species—one with long leaf-stalks and short acorn-stalks; one with short leaf-stalks and long acorn-stalks; and one with short stalks to both leaves and acorns.

The oak is remarkable for longevity, and for the durability of its timber. There are said to be oaks between a thousand and two thousand years old, and oaken furniture in use over a thousand years. In height this tree attains from 60 to 120 feet, and measures from two to six feet through the trunk; but it often exceeds these dimensions. Its lasting quality renders the timber particularly

suitable for ship-building and the construction of the heavier articles of furniture. The bark has valuable astringent properties, and a decoction of oak-galls with the addition of a solution of sulphate of iron produces a black ink. There are several species of ornamental oaks, of which the longest established in this country and the most familiar is the Holm, Holly, or Evergreen Oak (*Quercus ilex*), which has leathery leaves, with edges smooth, saw-like, or spined. As its name indicates, the tree has a superficial resemblance to a holly.

The 'pillared elm' comes next. There are two distinct species. The Common Elm (*Ulmus campestris*), Plate I., Fig. 2, is the more common in the southern part of England; the Wych Elm (*Ulmus montana*) in the northern portion and Scotland. Both have cork-like bark and leaves with a hairy surface, nearly as rough as sand-paper. They may be distinguished by observing that the common elm has leaves from two to three inches in length, finely notched, and seeds placed near the end of their oblong envelope; while the wych elm has its leaves longer, wider, and more deeply notched, and seeds set in the

centre of their envelope. The former has a profuse undergrowth of young shoots round the base of the trunk; the latter has fewer. The timber is very fine, and specially adapted for any purpose which requires continual exposure to wet. In age and size the elm closely approaches the oak, but is much more varied, a large number of named varieties being grown.

The 'warlike Beech,' to quote Spenser again (*Fagus sylvatica*), Plate I., Fig. 3, is to my mind a more lovely tree than either oak or elm.¹ It is, however, much less useful. It may be known by its polished grey stem, its smooth, glossy leaves, having a regular and unnotched outline, and its bristly nuts or 'mast.' Nothing can be more pleasant than to walk on a warm day through the cool and fragrant aisles of a beech-wood. As it has the property of repressing all rank growth beneath its shade, the ground is usually free from obstructions. The mould formed by myriads of decaying leaves is greatly esteemed by gardeners. The tree grows to an altitude of

¹ Gilbert White, of Selborne, calls it 'the most beautiful and ornamental of all forest trees.'

a hundred feet, with a diameter of six or seven. Its timber is now used chiefly for turned work and chair-making. The purple and copper beeches seen in ornamental grounds are simply modifications of the common species.

The leaves we have hitherto seen, however rough or irregular they may be, are at least obviously single. A different form appears in the Ash (*Fraxinus excelsior*), Plate I., Fig. 4. The leaves of this tree are composed of several pairs of leaflets, tipped by a single one. The walnut has a similar arrangement, and also the rowan; but the dark hue and aromatic perfume of the one, and the extreme delicacy of the other, prevent their being mistaken for those of the ash. The peculiar shape of the leaves imparts a light, feathery appearance to the foliage, which may be recognized at some distance. The timber is very useful. An old superstition attaches to the oak and ash in respect to their precedence in leafing. One generally precedes the other. If the oak comes into leaf first, the season ensuing will be dry; but if the ash leads, it will be wet. 'Oak choke, ash splash,' as the old saying has it.

On the banks of streams and ponds we find the Alder (*Alnus glutinosa*), Plate I., Fig. 5. Its leaf is large and of a dark-green colour, and it bears a hard, black fruit. Though usually of no great size, it reaches thirty or forty feet under favourable conditions. The timber is well suited for work exposed to the action of water, and is in some demand in Scotland for smoking fish. If a notch is cut in a twig, the white wound speedily becomes red. It produces a very fine charcoal, used in the preparation of gunpowder.

The Hornbeam (*Carpinus betulus*), Plate I., Fig. 6, may be passed by as a beech, if regarded carelessly. The leaves, however, are rough on the underside, and notched at the edges with double teeth, while the bark is smooth grey, spotted with white. The timber is very hard—indeed, like horn—whence probably the name of the tree is derived. It makes good fuel.

The last-named tree is often called the ‘witch hazel.’ The true Hazel (*Corylus avellana*), Plate I., Fig. 7, is of much smaller growth. It is frequently a mere bush, and seldom exceeds thirty feet, but its nuts endear

it to the young. The bright yellow green of its leaves makes it blend prettily with surrounding foliage, and the charm of many Scottish burnsides, those 'hazelly shaws' of which Burns speaks so lovingly, is largely due to the presence of hazel bushes. It has a certain resemblance to the alder, but the peculiar green of its leaves serves to distinguish it.

Of all the trees which adorn the Highland glens, the Birch (*Betula alba*), Plate I., Fig. 8, is the queen. Silvery white bark, tender drooping branches, and delicate foliage, give it a grace which no other tree excels, although the mountain ash may be said to equal it. A 'weeping' variety is also found, in which the twigs hang in long pendant tassels. In Russia the bark is used for tanning. A tiny tree, the Dwarf Birch (*Betula nana*), Plate II., Fig. 4, occurs in boggy places in the North. It grows to a height of perhaps a couple of feet, and is of little moment in this country, although in Lapland the inhabitants would miss it sadly.

One of the most majestic of our trees is the Sycamore or Great Maple (*Acer pseudo-platanus*), Plate I., Fig. 9, which is sometimes

incorrectly called the plane. It is distinct from either of the Eastern trees named sycamore and plane. At all seasons this is a fine tree, but in spring, when the leaves are in their first freshness, it is one of the most beautiful denizens of our parks. The leaves are of great size, measuring about seven inches across, and the seeds, when they attain maturity, are winged, and have the wings set angularly towards the seed. In this respect the sycamore differs from the field maple.

The Spanish or Sweet Chestnut (*Castanea sativa*), Plate I., Fig. 10, is readily known by its peculiar leaf. Its edible fruit is largely used on the Continent, but does not grow to its full size in this country. Consequently, the tree is here grown merely as an ornament, or as copse-wood. The Horse-chestnut (*Æsculus hippocastanum*), Plate I., Fig. 11, although not truly a chestnut, may be mentioned here, because the two trees are commonly associated in ornamental grounds. The leaves of the latter are broad, often a foot across, and many-fingered. The flowers are tall spikes—cream-coloured in some, red in others, and

occasionally a cross betwixt the two colours. The nuts are quite uneatable, but serve as playthings to boys. The tree grows to eighty or a hundred feet, but the timber is soft.

Another instance of confusion of relationships, on account of some trivial similarity, is found in the case of the Mountain Ash, or Rowan (*Pyrus aucuparia*), Plate I., Fig. 12. It is allied not to the ash, but to the apple. No tree is more closely associated with romantic scenery than this, although its use in garden decoration renders it familiar to many who never saw a mountain or glen. It attains a height of thirty to fifty feet. As a defence against the attacks of witches it was long held in esteem. When one is wandering through a Highland glen, he will come upon the site of deserted homesteads, still marked by the rowans, which were planted to defeat the machinations of witches, but were ineffectual against the more insidious attacks of sheep-farmers and deer-stalkers.

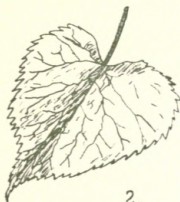
The Field Maple (*Acer campestre*), Plate II., Fig. 1, is purely ornamental. It has deep-green leaves, about three inches across, rough



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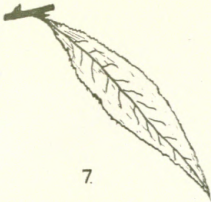


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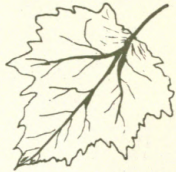


6.

1. Field Maple. 2. Lime. 3. Walnut. 4. Dwarf Birch.
5. Scots Fir. 6. Larch.



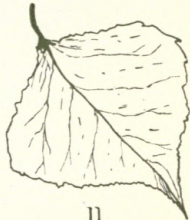
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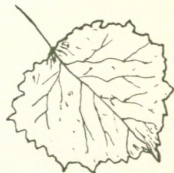
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7. White Willow. 8. Saugh or Sallow. 9. Osier. 10. White Poplar.
11. Black Poplar. 12. Aspen.

cork-like bark, and winged seeds having the wings horizontal in place of at an angle, as in the sycamore. Its wood has a repute in the manufacture of violins. The American maples produce a large quantity of sugar, but our species is of no use in that respect.

The bee-keeper has cause to love the Lime or Linden (*Tilia europæa*), Plate II., Fig. 2, for its fragrant blossoms are the haunt of countless bees, which fill the air with their hum, as we stand beneath the tree. Like the honey produced from heather, that from the lime has a high reputation. The stem is straight and tall, with smooth bark. The inner bark produces the 'bast' from which Russian mats are made.

An ornamental tree, which also produces agreeable nuts, is the Walnut (*Juglans regia*), Plate II., Fig. 3. It is a native of Persia, but has long dwelt with us. The timber is beautifully veined, and makes the best gun-stocks. Its nuts were said to be the food of the gods in the Golden Age. The leaves are of a deep green, and aromatic. The scent of the tree may be perceived at some distance.

The conifers are a large group, the members of which can only be discriminated by an inspection of their spines and cones. I shall mention two of the most important. The Scots Fir or Pine (*Pinus sylvestris*), Plate II., Fig. 5, is one of the distinctive features of Northern scenery. Its dark foliage gives it a gloomy appearance, but when the setting sun illuminates the recesses of a fir wood, it draws forth a glow of rosy colour, such as is not to be seen in any other forest. In favourable situations the tree reaches an altitude of a hundred feet. Its cone is two or three inches long. The pollen of this tree is very light, and yellow in colour, and when in spring it accumulates on the edges of puddles, we hear rumours of a 'sulphurous shower' having fallen.

The only other conifer I shall name is the Larch (*Larix europæa*), Plate II., Fig. 6. It is a more graceful tree, and has the peculiarity of shedding its needles in autumn. In early spring 'when rosy plumelets tuft the larch,' and it dresses itself in delicate green, it is exceedingly beautiful.

The Willows are another large and intricate

group of trees. They adorn the banks of rivers and ponds. It is worthy of remark that they thrive in damp and rheumatic situations, and that from their bark salicin is obtained, one of the most valuable specifics in rheumatic affections. The bane and the antidote, the ill and its cure, are often associated in Nature. The White Willow (*Salix alba*), Plate II., Fig. 7, has silky leaves which give a whitish reflection.

The Saugh, or Sallow (*Salix caprea*), Plate II., Fig. 8, has larger and broader leaves, dark green above, and covered beneath with white down. In spring the tree is hung over with bright yellow catkins, called by country folks 'palms,' and in some places borne to church on Palm Sunday.

The Osier (*Salix viminalis*), Plate II., Fig. 9, is of smaller growth. Its long, thin shoots are used for wicker-work, and it is thought that it was owing to the fine quality of the osiers, that the baskets of the ancient Britons had so great a repute. The leaves of the true osier are variable in length, having their edges without teeth or notches, the upper side veined and the under silky.

The last group at which I propose to look is the Poplars. They are near relations of the willows. The White Poplar (*Populus alba*), Plate II., Fig. 10, is prized for its rapid growth. Its wood is soft, but tough. Its leaves are dark green above, and white beneath, whence the name is taken.

The Black Poplar (*Populus nigra*), Plate II., Fig. 11, has its leaves pale green with yellowish stalks, and no white down on the under side. They are very late in appearing, and before they come forth the branches are covered with the male catkins, which resemble large, red caterpillars. The seeds are enveloped in white cotton.

The Aspen (*Populus tremula*), Plate II., Fig. 12, has dark, glossy green leaves, paler, but not white beneath, and so delicately poised that they quiver in the slightest breeze. Hence when we wish to express the idea that a man is in a state of extreme nervousness we say, 'he trembles like an aspen.'

The Lombardy Poplar (*Populus fastigiata*) cannot be mistaken for any other tree, on account of its upright growth, which resembles that of a gigantic yew. The branches, instead

of spreading sideways, point almost perpendicularly upwards.

It has not been my intention to furnish an exhaustive account of these trees. I merely desired to introduce them, and to indicate what a wide field for study they afford. Any one who desires to become more intimately acquainted with our British trees, will find the materials for attaining his purpose in the books named in the following list, and the authorities to which these refer. With the information which he has gained in this chapter, the reader will find that he can identify the trees which he is likely to see most frequently. When he knows the peculiarities of bark and leaf and trunk, which distinguish the various sorts of trees, he will no longer be indifferent to the composition of the groves in which he rambles. He will observe and note the presence of beech and oak, sycamore and elm, birch and hazel. He will perceive that the trees of the wayside and woodland are more varied than he had supposed. His attention having been once directed to this fact, he will soon observe the same infinite variety in the wild

flowers around his feet, and in the birds and insects that attend his wanderings. In short, he will begin to be a naturalist.

SOME BOOKS ON TREES

1. *Our Woodlands, Heaths, and Hedges.* W. S. Coleman. 3s. 6d. coloured; 1s. uncoloured.
2. *Wayside and Woodland Trees.* Edw. Step. 6s.
3. *The Forest Trees of Britain.* Rev. C. A. Johns. 5s.
4. *British Trees.* Hon. S. Tollemache. 14s. net.
5. *A Description of the Genus Pinus.* (1832). A. B. Lambert. (This is an expensive work, but is of great value in studying the conifers. It is, I believe, out of print.)

CHAPTER III

WILD FLOWERS

WILD flowers are as universal as trees, if less noticeable. No rambler, afield or otherwise, can fail to notice the trees, although he may readily fail to pay attention to the flowers, because to do so demands a certain amount of observation, and every pedestrian is not an observer. On this account I have placed the flowers after the trees, but I do not thereby imply that they are second in my esteem. On the contrary, I believe that some of the purest pleasures of life are associated with flowers—more especially wild flowers. They entwine themselves with many incidents of our lives, and appealing as they do to two senses, sight and smell, act as a powerful stimulus to the memory, and bring back to recollection ‘the

days of auld lang syne.' Longfellow likens them to

'Stars, that in earth's firmament do shine.'

Dr. Wendell Holmes carries this idea further. He feigns that after the fall of man the stars and flowers agreed to keep a watch on the human race, and to shame men into well-doing :

'A million sleepless lids, they say,
Will be at least a warning;
And so the flowers would watch by day,
The stars from eve to morning.'

The wickedness of human nature defeated this well-meant plan. The vigil of stars and flowers deters no one from sin ; but flowers certainly reduce the measure of human depravity. I do not say that every person who does not love flowers is evil ; but I do maintain that there is some element of good in every one who possesses that love. The love of flowers thus forms one redeeming feature in the character of many a bad man.

Fragile as many of them are, there is a tender grace about wild flowers, which makes them in their own place the equals of the richer and more highly cultivated garden

species. To realize this fully they ought to be seen in their favourite nooks and haunts. A bouquet of wild flowers is beautiful when freshly gathered, but the blooms soon fade and fall.

It is surprising how near these haunts come to the habitations of men. I remember once, when I was resident in a large town, and it was often impossible to go out to the open country, my brother and I used to try how many different sorts of wild flowers we could procure at the roadsides and in waste ground on the margin of the city, and we got a considerable variety. Great numbers of delicate blossoms—white, blue, yellow, and purple—grow in such unlikely spots, and bring the country into a place which man has made peculiarly his own.

I think it is a mistake for the ordinary lover of Nature to begin the observation of wild flowers by reading botanical works. If one has to profess a knowledge of botany as part of the qualifications for a profession or a degree, he must, of course, master the science, and cannot too soon begin its formal study. But for others, the wisest course, in my

opinion, is first to learn to know as many flowers as possible, so as to recognize and name them readily; then to acquire some knowledge of their uses and properties, and of the legends and stories connected with them; and lastly (if the precedent part of the course has inspired a genuine taste for the study), to enter upon the details of structure, growth, and classification, which constitute the subject of botany. It is my present intention to run lightly over a list of about fifty flowers, selected from various groups, the names of which ought to be familiar to every lover of Nature.

Any reader who wishes to prosecute the study further, will find ample guidance in the books enumerated in the list at the end of the chapter. In examining the flowers, I think the best and most interesting mode will be to take them in connection with the localities where we most frequently see them.

Of all places in which we may look for wild flowers, the richest are fields and meadows. Free exposure to sun and air is peculiarly favourable to their growth. Accordingly, a great number of our prettiest kinds, although

they are met with in other localities, are abundant in the open fields.

A familiar trio greet us at the outset—the Daisy (*Bellis perennis*), the Buttercup (*Ranunculus bulbosus*), and the Dandelion (*Taraxacum officinale*). These are too well known to require any figure to aid their recognition. There are several species of buttercup, but I have named the earliest and one of the commonest, which is sometimes called the bulbous crowfoot.

The mere mention of those three flowers is sufficient to conjure up a vision of spring fields, such as is most sympathetically expressed by Mr. Vernon in *The Harvest of a Quiet Eye*. The sheet of white daisies covering the grass, the masses of golden buttercups, and the rich yellow stars of the dandelions, rising up amidst the fresh green herbage, are indelibly impressed on the minds of all who have spent their childhood in the country. Some idea of the beauty of such scenes may be formed even by those who dwell near the parks in a large city. Those plants do not improve the pasture, and gardeners wage war upon them when they show themselves in

lawns, although I must confess that, while admitting how much they damage the velvety turf, I regret the necessity for their destruction.

Another marked flower is the Oxeye, or White Chrysanthemum (*Chrysanthemum leucanthemum*), Plate III., Fig. 1. It is also known as the Moon- or Horse-daisy—'horse' in this instance, as in many others among plant-names, standing for 'big'. It may be seen towering above the long grass, and in spots where it has clustered together, its pure white blooms glisten like a patch of snow.

We have another chrysanthemum, the Corn Marigold or Marguerite (*Chrysanthemum segetum*), Plate V., Fig. 5, which gilds the cornfields somewhat later in the year. It is a showy flower, and like its white relative is effective in decoration, but farmers do not love to see it. In Scotland it is called 'the guile,' a name derived from the same root as the heraldic term 'gules,' and alluding to its golden hue. We have no wild flower which more perfectly recalls the precious metal.

There is a big white bloom which we must not confuse with the oxeye—the Corn



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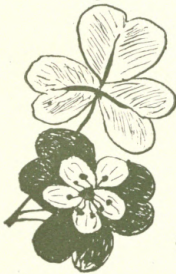
1. Oxeye. 2. Corn-flower. 3. Rose Campion. 4. Ragwort.
5. Heartsease. 6. Restharrow.



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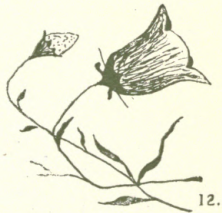
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7. Wood Anemone. 8. Wood Sorrel. 9. Wild Hyacinth.
10. Tormentil. 11. Foxglove (reduced). 12. Harebell.

Feverfew (*Matricaria inodora*), Plate V., Fig. 4. Its threadlike, branching leaves and aromatic odour serve to distinguish it. The juice of this plant has tonic properties, which make it useful as a febrifuge, hence the title 'feverfew'; but the introduction of powerful exotic drugs has diminished the medicinal repute of our native herbs.

A flower so beautiful, that it has been introduced into gardens, is the Blue-bottle, or Cornflower (*Centaurea cyanus*), Plate III., Fig. 2. It is especially plentiful among wheat, where it spots the field with points of blue of a shade so distinctive that 'cornflower blue' is a recognized tint. Occasionally the flower is rose or white. The genus to which it belongs has a reputation for healing properties, and from a legend that one of them was used by the Centaur Chiron to heal his wounded foot, the group has been called *Centaurea*.

The Campions—Rose (*Lychnis dioica*) and White (*Lychnis vespertina*)—Plate III., Fig. 3, are showy flowers. The latter is called the Evening Campion, because it opens towards evening and breathes forth a perfume after

dusk. I have seen the bank of a river so thickly covered with rose champions that it positively glowed with flame colour.

The Ragwort (*Senecio jacobæa*), Plate III., Fig. 4, with its great heads of yellow flowers is a handsome plant, but unhappily has a coarse, rank smell, which has ruined its popularity. The Latin name suggests the 'grey-beards,' which cover the plant after the flowers wither.

Many beautiful thoughts are associated with the next flower, the Heartsease, or Field Pansy (*Viola tricolor*), Plate III., Fig. 5. It loves pasture land, and generally poor soil. It is of various colours, blue, purple, or cream, but ever modest and unassuming, a fit emblem of a quality so beautiful as serenity.

The Rest-harrow (*Ononis repens*), Plate III., Fig. 6, is also found on poor soil, particularly in sandy places. Its pale rose, pea-shaped flowers are profusely scattered over a wide expanse of surface, and its long, tough roots spread far underground, checking the implements of the farmer, whence the name 'arrest harrow.' Boys rejoice in its

blooms, as ensigns pointing to where its liquorice-flavoured roots may be dug up and chewed. It is a thorny plant, and the more barren the land the more spiny it is, thus preserving for us one of the marked features of the desert flora, to which it had at one time undoubtedly belonged.

Much interest attaches to the Scarlet Pimpernel (*Anagallis arvensis*), Plate IV., Fig. 8. In the first place, it is one of our two scarlet wild flowers, the other being the Scarlet Poppy (*Papaver rhæas*). Sometimes it is found of a blue or white colour, but scarlet is its usual hue. Then, it has the property of foretelling the approach of wet weather by closing its flowers. It is also regular in its time of opening and closing, expanding at 7 a.m. and closing at 2 p.m. I had occasion at one period to pass a corn-field twice daily. One side of the field was filled with pimpernels, and in a sunny morning was a blaze of red. In the afternoon, however bright the sun, not a spot of red was visible.

The Common Fumitory (*Fumaria officinalis*), Plate IV., Fig. 10, is a pretty,

delicate flower, rose-coloured with tiny purple tips, which grows amongst corn and hay. Its name is derived from the Latin *fumus terræ*, earth's smoke, from a curious fancy that it sprang from the ground without seed, the product of vapours arising from the earth.

The Ribwort Plantain, or ribgrass (*Plantago lanceolata*), Plate IV., Fig. 12, is not at all like a flower. Its brown head with cream-coloured filaments, at the end of a long, tough stalk, renders it eminently suitable for a plaything. The children call the flowers 'soldiers' and (in Scotland) 'carle doddies,' and fight mimic battles with them, each trying to strike the head off the other's soldier. The leaves have a certain value to the grazier for feeding purposes.

Amongst the long grass there is a small, pale-blue flower, with some of the blooms tinged with pink, closely resembling the forget-me-not, of which, indeed, it is a relation. This is the Field Scorpion-grass (*Myosotis arvensis*).

The Meadow Vetchling (*Lathyrus pratensis*), Plate V., Fig. 7, with yellow, pea-shaped flowers, abounds in damp meadows. Its stem

runs along the ground, and its blossoms are in clusters of six or eight on each stem.

The Sorrel or 'Soorock,' as it is called in Scotland (*Rumex acetosa*), Plate V., Fig. 12, is one of the dock tribe. It may be distinguished from the true dock by having bunches of small reddish flowers, and leaves with a pleasant acid taste; the docks, on the other hand, have green flowers, and their leaves are not sour. The leaves of the dock are a specific in case of burning with nettles. The juice has a soothing effect. The root of the sorrel yields a red dye, and the leaves make a good salad.

A smaller species called Sheep's Sorrel (*Rumex acetosella*) is abundant upon dry pasture on poor soil. The leaves and stem turn rich red towards the end of summer. I have seen a whole field rendered quite red by them. The plant is only five to ten inches in height. It also has an acid flavour.

Leaving the fields, I shall now look at roadsides and waste ground, premising that some of the flowers I am about to mention are found in fields and other places besides those in which I am at present looking.

The Harebell (*Campanula rotundifolia*), Plate III., Fig. 12, is one of the commonest and most delightful of roadside flowers. Its pale-lilac bells on thin, threadlike stalks cover grassy banks, waving in the lightest breeze. It is the well-known favourite, the bluebell of Scotland. A white one sometimes mixes among the blue, and it is pleasant to find a rarity of this sort.

The Germander Speedwell (*Veronica chamædrys*), or Birdseye, Plate IV., Fig. 7, is a bright-blue flower, sometimes erroneously called a forget-me-not. It has four petals, one of which is always smaller than the rest; while the forget-me-nots have five. There are many species of speedwell, but they all have this arrangement of petals, and most of them have a bright white eye in the centre of the blue.

The Sweet-briar Rose (*Rosa eglanteria*), also called Eglantine, Plate IV., Fig. 5, and the Dog Rose (*Rosa canina*) are cherished ornaments of our waysides. The former may be readily known by its strong aromatic fragrance. The latter varies in hue from deep red to white, and its leaves are either



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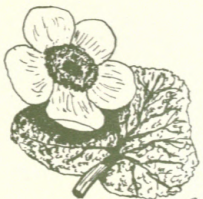
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1. Primrose. 2. Sweet Violet. 3. Lesser Celandine. 4. Wood Cranesbill.
5. Sweetbriar Rose. 6. Marsh Marigold.



7.



10.



8.



11.



9.



12.

7. Germander Speedwell. 8. Scarlet Pimpernel. 9. Herb Robert.
10. Fumitory 11. Bedstraw. 12. Ribwort Plantain.

smooth or downy. The hips which cover the roses in autumn form a staple food of birds, and their abundance or scarcity is accepted by country folks as an indication of a severe, or a mild, winter.

On rough banks the Herb Robert (*Geranium Robertianum*), Plate IV., Fig. 9, is not uncommon. Its flowers are pink or white.

In masses of yellow or white, Our Lady's Bedstraw (*Galium verum*), Plate IV., Fig. 11, adorns the roadside in the height of summer. It is one of the last flowers to appear before the tall grasses, scabious and harebells take the places of the bird's-foot trefoil and small flowering plants. There is a pretty legend to the effect that this plant was used to make the bed of the Virgin Mary, and as its numerous flowerets are cross-shaped, her bed was thus one of crosses. The Scottish Highlanders make a red dye with the roots boiled in alum, and curdle milk with its leaves mixed with those of the nettle and a little salt.

The Bird's-foot Trefoil (*Lotus corniculatus*), Plate V., Fig. 1, which I have just mentioned, is plentiful at the sides of roads, as well as

in fields. Its blossoms are yellow, often tinged with red or orange, and are pea-shaped with such a fanciful resemblance to a tiny shoe, that it has gained for the plant the common name of Lady's Slipper. The leaves are smooth, not unlike those of clover, and the seed-pods take the shape of a bird's foot. It is one of the plants which the Greeks named 'Lotus.'

The Wild Strawberry (*Fragaria vesca*), Plate V., Fig. 2, frequently spreads along the grassy banks at roadsides, although it is more abundant in woods, or at the sides of fields. It has a pretty, white flower, but the fruit, unless in specially favourable circumstances, has little sweetness or flavour. The name 'strawberry' may be derived from the old fashion of threading the fruit on a straw for sale.

Two very beautiful yellow flowers have a creeping habit of growth. The first of these is the Creeping Cinquefoil (*Potentilla reptans*), Plate V., Fig. 8, which has soft velvety flowers of five petals, and leaves arranged in groups of five. The other is the Silver Weed (*Potentilla anserina*), less

poetically termed Goose Grass. It has somewhat similar flowers, but the leaves are covered on the under sides with silver-white, silky hairs. The roots are tough. The flowers appear in June or July. The plant, soaked for nine days in buttermilk, produces a wash for the complexion, which once enjoyed some repute. Both these cinquefoils are closely related to the strawberries.

I shall next look at some of the woodland flowers. One of the earliest and sweetest is the Wood Anemone or Windflower (*Anemone nemorosa*), Plate III., Fig. 7, which carpets the space beneath the trees with tender, white flowers delicately tinged with purple. In suitable spots it grows in great sheets. Along with it we generally find the Wood Sorrel (*Oxalis acetosella*), Plate III., Fig. 8. This plant has nothing in common with the sorrels already spoken of, except the sourness of the leaves, which are strongly impregnated with oxalic acid. It has a pleasant flavour, like that of the lemon, and the juice yields a salt, which is very efficacious in removing ink-stains. Its threefold leaf is thought to

be the true shamrock, and, combined with the purple-spotted flower, has made the plant a favourite symbol in the work of religious painters, suggesting both the Trinity and the Passion.

In sheets of blue, gleaming through the stems as if it were a lake, are beds of Wild Hyacinth (*Endymion nutans*), Plate III., Fig. 9. It is sometimes called the bluebell, and is to most people associated with the happiest memories of Spring.

The graceful Foxglove (*Digitalis purpurea*), Plate III., Fig. 11, with dignified and lofty spikes, is, perhaps, hardly a woodland flower, preferring open hillsides among bracken. Its bells are poisonous, and must not be chewed. The name has nothing to do with Reynard the Fox, but alludes to 'the Folk,' that is to say, the fairies. Our ancestors did not care to name these little people too specifically.

The Primrose (*Primula acaulis*), Plate IV., Fig. 1, is literally 'the first rose,' although it has in fact no connection with the rose tribe. It used to be a great pleasure to us, when children, to go to the woods and dig primrose roots to form borders to our garden plots.

The plants form an excellent border, green at all seasons, and exceedingly pretty in the time of flower. The lilac Scottish Primrose (*Primula scotica*) is a native of the far north.

The Sweet Violet (*Viola odorata*), Plate IV., Fig. 2, grows in England in early Spring, on banks and in woods; but in Scotland it is almost unknown. It is of two colours, white and violet. The petals and roots have emetic properties, and blotting-paper stained with blue syrup of violets is reddened when immersed in a solution containing acid. More common in the north is the Dog Violet (*Viola canina*), which resembles the other in general appearance, but is scentless, and the flowers are larger and set on longer stalks. It blooms along with the anemones and wood sorrel.

One of the very first of the Spring flowers is the Lesser Celandine, or Pilewort (*Ranunculus ficaria*), Plate IV., Fig. 3, a near relation of the buttercups, as its Latin name indicates. It has brilliant yellow, star-like flowers, and soft, dark-green and spade-shaped leaves. A bank covered with celandines and creeping ivy is a charming sight,

the more so that it is to be seen when other blossoms are scarce. The Wood Cranesbill (*Geranium sylvaticum*), Plate IV., Fig. 4, shows its purple-pink blooms on wooded banks. Long spikes called 'cranes'-bills' appear after the flowers. Another little cranesbill is to be found in meadows—the Dovesfoot Cranesbill (*Geranium molle*). Except that it is smaller, the figure of the one will serve for the other.

I shall conclude by mentioning a few flowers which are to be sought on moors, marshes, sea-coast, or other rough ground.

Of these, one of the most universal is the Yellow Tormantil (*Potentilla sylvestris*), Plate III., Fig. 10. Growing on high, wild land, it is very attractive amidst its unkindly surroundings. Its roots have astringent properties, and make a useful gargle in cases of sore throat. The Marsh Marigold (*Caltha palustris*), Plate IV., Fig. 6, flowers in April and May, growing in wet places. The blooms have a particularly fine shade of yellow, and are often gathered for dyeing.

Near the other, but later in the year, we find the Marsh Forget-me-not (*Myosotis*



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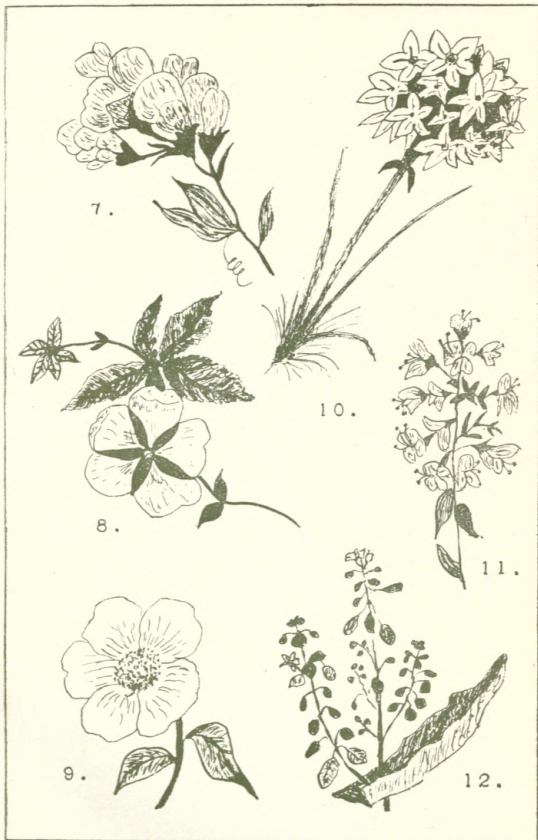


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1. Bird's-foot Trefoil. 2. Wild Strawberry. 3. Marsh Forget-me-not.
4. Corn Feverfew. 5. Corn Marigold. 6. Fine-leaved Heath.



7. Meadow Vetchling 8. Creeping Cinquefoil. 9. Rock Cistus.
 10. Sea Pink or Thrift. 11. Wild Thyme. 12. Sorrel.

scorpioides), Plate V., Fig. 3, a lovely blue flower, which is one of the prettiest of its family, and might be the very plant which led to the unhappy tragedy which gives these flowers their name.

The most distinguished moor plants are the heaths. I have chosen as a specimen the Fine-leaved Heath (*Erica cinerea*), sometimes called Cat Heather, Plate V., Fig. 6. It has crimson flowers and fine leaves arranged in threes. The white variety of this plant brings luck to the finder.

Descending now to the coast, we find on stony hillsides the Rock Cistus, or Rock Rose (*Helianthemum chamæcistus*), Plate V., Fig. 9. It is not a true rose. The flowers are yellow, very fragile, and show only in bright sunlight. There is something about the petals which makes this plant quite unlike any of the many yellow flowers which we have. It is of a satiny texture. A rose-coloured variety, a native of Palestine, has been deemed to be the floral emblem of the Rose of Sharon. But most of our memories of the seaside are bound up with the Sea-Pink, or Thrift (*Statice maritima*), Plate V., Fig. 10. It is

both pink and white, and is met with among mountains as well as by the sea. On cliffs at the coast its pale blossoms toss in the sea breeze in all sorts of inaccessible places.

Last of all I mention the Wild Thyme (*Thymus serpyllum* and *Thymus chamædris*), Plate V., Fig. 11. On links and sandhills the air is filled with the fragrance of those delightful plants. There are two sorts. The first has its stem resting on the ground, and leaves three or four times as long as they are broad, with rounded ends; the other has an upright stem, and egg-shaped leaves. Both have purple flowers, and make the most delightful of cushions upon which to lie and watch the sea and the ships.

My design prevents me from passing beyond the flowering plants, and glancing, however hurriedly, at the lovely group of ferns, the mosses, or the seaweeds. These in due time will be sought out and studied by the lover of plants; but in themselves they form a subject even more extensive than that which I have here introduced.

SOME BOOKS UPON WILD FLOWERS

1. *Wild Flowers*. Spencer Thomson. 3s. 6d.
2. *The Botanist's Pocket-book*. W. R. Hayward. 4s. 6d.
3. *Flowers of the Field*. Rev. C. A. Johns. 7s. 6d.
4. *Our Country's Flowers*. W. J. Gordon. 6s.
5. *How to Study Wild Flowers*. Rev. Geo. Henslow. 2s. 6d.
6. *Wild Flowers*. Anne Pratt. In two vols. 8s. It is a very useful work.
7. *Handbook of the British Flora*. George Bentham. 9s. net.
8. *British Wild Flowers*. Thomas Moore. 14s. net.
9. *Wayside and Woodland Blossoms*. Edward Step. Two Series. The set 12s. net.
10. *Familiar Wild Flowers*. F. E. Hulme. In eight vols. 3s. 6d. each.
11. *British Wild Flowers*. J. E. Sowerby. £3 3s.

CHAPTER IV

BIRDS' EGGS

THERE has been a great deal of foolish writing and speaking on the subject of birds'-nesting. When the writers of a certain class of tales for young people wish to describe a very bad boy, they usually call him 'a robber of birds' nests.' He may be further characterized as rude to his mother, or unkind to his sisters, a breaker of windows, or a truant from school; but the head and front of his offending is his alleged cruelty to the birds.

Now, it is undoubtedly a cruel and cowardly act to wantonly destroy the nests or eggs of any bird; but to collect the eggs of birds in a proper and scientific manner is not wanton destruction. Indeed, the surest way to prevent a boy from being cruel to birds, and to make him take an interest in

their protection, is to encourage him to form a collection of their eggs. I have known many boys who were enthusiastic egg-collectors, and there was not one of them who would either have been cruel to a bird, or have permitted another to be so, if it were in his power to prevent it.

Four rules should be scrupulously observed—

1. Never take the eggs of game birds, or of birds protected by law.

2. Never take more than one or two eggs from a nest.

3. Never take 'hard-set' eggs.

4. Never damage the nest itself.

With respect to the first of those rules, it has to be observed that pheasants, partridges, grouse, black-game, and bustards are game, and their eggs are not to be taken without permission. There are also a large number of birds whose eggs are protected under the Wild Birds' Protection Acts. The regulations on this point vary in different counties. The following list contains a number of the names of birds which are commonly scheduled. I would recommend that the eggs of these

birds should not be taken in any district until it has been ascertained that it is there permissible to do so:—

Bullfinch	Owl, Tawny
Buzzard	Oyster Catcher
Chough	Peregrine Falcon
Crossbill	Plover, Golden
Dipper	Plover, Ringed
Dotterel	Pochard
Eider Duck	Quail
Goldfinch	Raven
Great-crested Grebe	Sheld Duck
Gull, Common	Shoveller
Hawfinch	Siskin
Jay	Skylark
Kestrel	Snipe
Kingfisher	Teal
Mallard	Tern, Common
Merlin	Tern, Little
Nightjar	Tern, Sandwich
Osprey	Tufted Duck
Owl, Barn	Widgeon
Owl, Long-eared	Woodcock
Owl, Short-eared	Woodpecker, Great Spotted

The taking or destroying the eggs of the Lapwing (*Vanellus vulgaris*) is generally prohibited after April 15.

My second rule is based on the general principle that if one or two eggs be carefully removed from a nest, the hen bird will lay others in their place, and so the number will be made up. Some collectors think it

necessary to have a 'clutch' of each kind—that is, the contents of a complete nest; but this is only excusable in the case of naturalists, who are making a special study of ornithology, and particularly of variation in the colours and markings of eggs.

A similar remark applies to my fourth rule. If a naturalist is forming a collection of nests, each with a full complement of eggs, he will have to remove the nests which he needs. Otherwise, eggs are much better shown upon pink or white cotton-wool.

But, indeed, it is not absolutely needful to take either nest or eggs. Great pleasure is to be derived from seeing these in the situation where the parent birds placed them. The skill exhibited in choosing a spot and constructing a nest, and the pretty contrast between the delicately tinted eggs and the materials of which the nest is composed, are a pure source of gratification. One recalls Wordsworth's account of the finding of a nest—

'Behold, within the leafy shade
Three bright blue eggs together laid!
On me the chance discover'd sight
Gleam'd like a vision of delight.'

It is, however, a common error to suppose that a proper knowledge of eggs can be acquired apart from a knowledge of the birds themselves. One ought first to learn to know the parent birds, their habits, and their nesting-places, and then to collect their eggs, if one wishes to do so. In many instances it is almost impossible to be sure as to the particular bird which has built a particular nest, unless we can identify the bird. Any account of the parent birds would extend this chapter beyond its assigned limits, and I must, therefore, refer those, who wish to gain information respecting them, to Mr. Howard Saunders' *Illustrated Manual of British Birds* (21s.), or another of the many excellent books on birds.

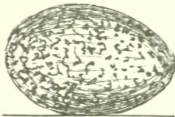
The first nest of the season, and the first which any one finds for himself, is usually that of the Song Thrush or Mavis (*Turdus musicus*). It builds in a thick bush, and often before the leaves have appeared. The nest is composed of grass and moss, plastered with mud, and contains from four to six light greenish-blue eggs, marked with a few large dark spots (Plate VI., Fig. 1).



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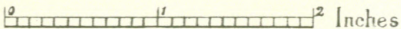
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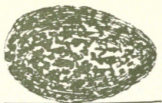
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1. Song Thrush. 2. Blackbird. 3. Redbreast. 4. Whinchat
5. Wren 6. Blue Titmouse.



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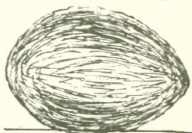
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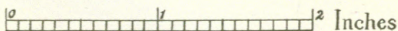
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7. Skylark 8. Chaffinch. 9. House Sparrow. 10. Yellowhammer.
11. Greenfinch. 12. Starling.

Equally abundant, and somewhat similar in appearance, is the nest of the Blackbird or Merle (*Turdus merula*), one of our most charming songsters, though a greedy fruit-eater. It is placed in a thick bush, and is composed of fibres and grass, coated with mud and lined with grass, and the eggs, four to six in number, are light blue, thickly freckled with reddish-brown (Plate VI., Fig. 2). They are exceedingly variable. It must not be forgotten that although the cock blackbird is of a deep black, the hen is of a sooty brown shade with a light and freckled breast.

The darling of children and poets, the Robin Redbreast (*Erithacus rubecula*), is in truth a fierce little bird, and the cocks fight savagely. It places its nest on the ground under a hedge, or in a mossy bank—a neat structure of grass and leaves, lined with hair. It lays five or six yellowish-grey eggs, spotted with pale reddish-brown (Plate VI., Fig. 3).

Most wanderers in rural parts have noticed the Whinchat (*Pratincola rubetra*), with its peculiar chattering call. It places its nest on the ground beneath a whin-bush, using dry grass lined with moss or wool. It lays five or

six eggs (Plate VI., Fig. 4), blue-green, finely spotted at the large end with red-brown.

The companion of Robin Redbreast, the Wren or Jenny Wren (*Troglodytes parvulus*), makes a very interesting nest in a hole in a bank or tree-trunk, or in a bush. It is composed of moss and similar materials, lined with feathers, and is ball-shaped with a hole in the side. There are five to seven eggs—white, dotted with light red at the larger end (Plate VI., Fig. 5).

The Blue Titmouse or Tom-tit (*Parus cæruleus*) nests in a hole in an old wall or a tree, using moss, lined with hair and feathers. The eggs are six to ten or twelve in number, reddish-white, spotted with light red (Plate VI., Fig. 6).

The 'blithesome and cumberless' Skylark or Laverock (*Alauda arvensis*) places its nest on the ground, in a field. It is composed of grass loosely put together, and is very difficult to find. More frequently one comes upon it by chance, when passing through a grass field. It contains four or five greenish-grey eggs, freckled with light brown (Plate VI., Fig. 7). The song of the lark is remarkable for the

impression of spontaneous joy and gladness, which it conveys to the listener, and both the bird and its eggs are protected by the law.

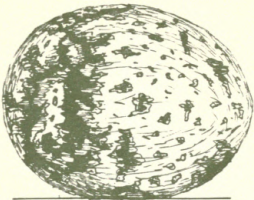
The song of the Chaffinch, or Shilfa (*Fringilla cælebs*), is monotonous but merry. Its nest is singularly neat. It is built in the fork of a tree or branch. The materials are moss, hair, and feathers, skilfully interwoven, and artfully covered on the outside with lichens, so that it is not easily seen, even when one is looking straight at it. The eggs are five, dull bluish-green, clouded with dusky red and blotches of a deeper tint (Plate VI., Fig. 8).

The most impudent and best-known of birds is the House Sparrow (*Passer domesticus*), whose nest is generally disclosed by its untidiness. It is set in a crevice of a wall, or beneath the eaves of a house, and is built of straw, lined with feathers. The bird lays five or six dull light-grey eggs, spotted and streaked with ash colour and dusky brown (Plate VI., Fig. 9). Notwithstanding its plentifulness and obvious appearance, the situation of the nest renders it difficult to reach, and it is scarcely possible to get the eggs without a ladder.

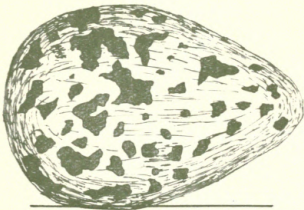
A bird with a very evil name, totally undeserved, is the Yellowhammer, or Yellow Bunting (*Emberiza citrinella*), called in Scotland the 'Deil's Bird.' No one who has walked in the country can fail to remember the peculiar plaintive song of this bird, as it perched upon bushes on the roadside, flitting before the pedestrian as he proceeded. It nests under a bank, beneath a bush, or in a clump of grass. The nest is constructed of grass stems and hair, and contains four or five grey eggs (Plate VI., Fig. 10), streaked and speckled in a most peculiar manner with dark reddish-brown.

The Greenfinch (*Ligurinus chloris*) is one of our most common birds, and may be known by the yellowish-green feathers on the head and back. It nests in a low, thick bush, using fibrous roots, moss or wool, lining it with hair and feathers. It lays four to six eggs (Plate VI., Fig. 11), of a bluish-green, sprinkled with reddish-brown spots, especially at the larger end.

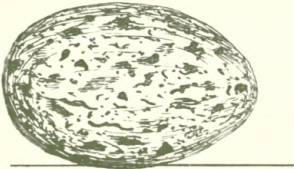
In my youth, we in the North used to consider the Starling (*Sturnus vulgaris*) a rare bird; now it is not uncommon. It chooses for



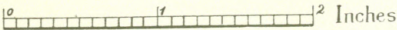
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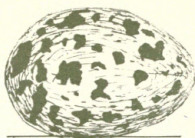
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1. Sparrow Hawk. 2. Lapwing. 3. Rook.



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4. Missel-thrush. 5. Hedge Sparrow. 6. Sedge Warbler.
7. Meadow Pipit. 8. Linnet. 9. Swallow.

its nest some inaccessible place—a hole in a rotten tree, an unused dovecot, a cranny in a ruined building, or the like. The nest is a large structure made of straw lined with hair, and contains four to seven delicate greenish-blue eggs (Plate VI., Fig. 12). The starling sometimes drops its eggs on the ground in a most unaccountable way. On one day I picked up two of them, quite unbroken, which were lying on the grass beside the path, half a mile apart.

The birds of prey used to be placed first in lists of species; but most modern naturalists begin with the thrushes. The *Raptores* are, however, a very important group, and as a representative of them I have selected the Sparrow Hawk (*Accipiter nisus*). It builds in a tree, making its nest of sticks lined with fibres. It lays from four to six eggs, bluish-white, with reddish-brown blotches, mostly at the larger end (Plate VII., Fig. 1). The nests of birds of prey are invariably in dangerous situations, yet boys do not hesitate to risk their lives in pursuit of the eggs or young.

I knew of one instance which well illustrates this fact. A certain boy was most

desirous of possessing a young hawk. He discovered that a sparrow hawk had built in a tree which grew out of the face of an old quarry. The tree was an ash, smooth of stem, and absolutely without branches for over twenty feet. Its roots were some distance down the rock face, and the trunk overhung the void beneath, at least sixty feet from the ground.

A slip meant death. But the boy was not to be daunted. He was unable to visit the spot except on Saturdays, when the school had a whole holiday. The first Saturday on which he managed to climb to the nest, he found four eggs. Next week he repeated his perilous passage and found young birds. Another week he returned and found the birds well grown, but still too young for hand-feeding. By another week they might have flown. To prevent this, he tied the legs of the young birds to the edge of the nest, in order that they might not escape, and yet would be fed by the parent birds. On the fourth Saturday he went back and discovered that two of the birds were dead, but the other pair were sufficiently developed

for his purpose, and with extreme difficulty he managed to descend the slippery trunk carrying two struggling hawks.

I am not telling this tale as an account of a feat to be imitated; but as an example of boyish daring. To climb the tree in safety once would have been remarkable; to do so with impunity four times was wonderful.

No one who has crossed a moor or open down can have failed to observe the Lapwing (*Vanellus vulgaris*). Its long-drawn cry of 'pewit' has given it another name, and its habit of enticing enemies from the neighbourhood of its nest by feigning inability to fly, is so well-known, that it serves as a means of ascertaining the vicinity of a nest. This is a primitive affair, usually consisting of bent or grass laid in a hollow or furrow. There are four eggs (Plate VII., Fig. 2), dark olive-brown with blackish blotches, and they are often to be seen in the market exposed for sale as those of the plover.

The Rook (*Corvus frugilegus*) is another familiar bird. It places its nest in a tree. The structure, which, with a little repair, serves year after year, is made of sticks

plastered with mud and lined softly. There are four or five eggs, bluish or greenish grey, speckled and splashed with brown (Plate VII., Fig. 3). The rook is of much use in killing grubs; but it also destroys a considerable amount of grain and potatoes, so that on the whole it is regarded as an enemy by the farmer.

The Missel-thrush, or Storm Cock (*Turdus viscivorus*) builds openly in the fork of a tree, sometimes quite near a path. It uses grass, moss, and wool. It lays four to six eggs, which are greyish-white, with red and violet spots (Plate VII., Fig. 4).

The nest mentioned by Wordsworth, in the lines I have quoted, was probably that of the Hedge Sparrow, or Dunnock (*Accentor modularis*). It is one of the common hedge-nests, and is built of moss and grass, lined with wool and feathers. The eggs are four to six in number, and of a bright bluish-green (Plate VII., Fig. 5). They cannot be mistaken. This bird is very often the foster parent of the young cuckoo.

The Sedge Warbler (*Acrocephalus phragmatis*) chooses a low bush, or a tuft of grass,

near water, and there places its nest of dry grass stems, lined with moss and a little horse-hair. It lays four to six greenish-grey eggs, freckled with darker colour (Plate VII., Fig. 6).

A difficult nest to find is that of the Meadow Pipit, or Titlark (*Anthus pratensis*). Its eggs resemble those of the lark, but are much smaller. The nest is placed on the ground, and is composed of dry grass lined with bents and hair, and contains five or six eggs—pale grey, freckled with brown (Plate VII., Fig. 7).

The Linnet (*Linota cannabina*) builds in a furze or whin-bush. The materials are moss, roots, and wool, lined with feathers. It contains four to six eggs of a bluish-white shade, with reddish-brown and dark purple spots and shading (Plate VII., Fig. 8).

I shall choose as my last example that friend of man, the Swallow (*Hirundo rustica*). It places its nest under the eaves of a house, or lintel of a window, or on the ledge of an out-house, building it skilfully of mud and straw lined with feathers. The eggs are four to six in number, white, with brown, grey, and chocolate spots, which are mostly at the

larger end (Plate VII., Fig. 9). The bird may be confused with the House Martin, but the two can readily be distinguished if one bears in mind that the swallow has a very large tail and no white on its back, while the martin has a small tail and a distinct white band. Even at a distance the blacker appearance of the swallow catches the eye.

In conclusion, I repeat that no one ought to touch the eggs of a bird, unless he is in good faith making a collection, or has to destroy them for the purpose of reducing the numbers of harmful species. If he is making a collection for study, let him adhere to the rules I have laid down. Birds'-nesting would, under these circumstances, cease to have the bad name which it has acquired with certain folks.

SOME BOOKS UPON BIRDS' EGGS

1. *British Birds' Eggs and Nests.* Canon Atkinson. 3s. 6d.
2. *Birds' Nests and Eggs.* Rev. C. A. Johns. 3s.
3. *Nests and Eggs of Familiar Birds.* H. G. Adams. 5s.
4. *British Birds' Nests.* R. Kearton. £1 1s.
5. *Birds' Eggs of the British Isles.* A. G. Butler. £1 1s.
6. *Nests and Eggs of British Birds.* Rev. F. O. Morris. £3 3s.
7. *Coloured Figures of the Eggs of British Birds.* Henry Seebohm. £3 3s.
8. *Coloured Illustrations of the Eggs of British Birds.* W. C. Hewitson. £4 14s. 6d.

CHAPTER V

BEETLES, GRASSHOPPERS, ETC.

IT is more than two thousand years since Aristotle observed that beetles are not mere creeping things, but are gifted with powers of flight. He perceived that they had wings under hard cases, and thence gave them the name that the Order in which they are placed now bears—*Coleoptera*, or Sheath-winged insects.

There are three Orders of insects in which the upper pair of wings serve as a cover to the lower pair. Of these the *Hemiptera*, or Bugs, may be at once set aside, in a comparison with the beetles, because any possibility of confusion is prevented by the substitution in their case of a proboscis adapted to sucking their food for jaws adapted to bite it. The *Coleoptera* and *Orthoptera* are not so readily distinguished. The most obvious points of distinction are to

be found in the degree of hardness possessed by the wing-covering, and the manner in which the two halves of it meet. Amongst beetles the wing-covers, called *elytra*, are usually hard and brittle, and the two halves meet in a straight seam, or 'suture.' In some of the exotic species these *elytra* are so hard, that ornaments are made of them, and, when placing specimens in a cabinet, it is scarcely possible to thrust a pin through them without first boring a hole for it. Amongst the cockroaches, grasshoppers, and their kindred, the wing-covers, called in this group *tegmina*, are of a tough, leathery consistence, and the halves, in place of meeting in a straight seam, slightly overlap each other. This latter point will be apparent on comparing a tiger beetle with a cockroach. For the scientific discrimination of the Orders, many other points have to be defined, but for my present purpose these two will suffice.

People talk of 'the beetle' as if there were but one living creature so called. The nursery rhyme about Cock Robin affords an example of this manner of speech: 'I, says

the beetle, with my thread and needle.' Those who speak in this way are not aware, or forget, that there are between three and four thousand different sorts of beetles in this country, and tens of thousands abroad, particularly in the tropics. Indeed, we cannot guess how many there may be, for there are vast regions in which little or no collecting has been done.

It will readily be supposed that it is no light task to undertake the study even of our British species. The Order includes many insects, which are not popularly called beetles, such as the glow-worms, Spanish flies, skipjacks, weevils, turnip flies, and lady-birds. *Per contra*, we must remember that the black beetle of the kitchen is not a beetle, but a cockroach. Some method has to be adopted to subdivide the mass, and accordingly the species have been gathered into divisions and subdivisions, which my space will not allow me even to name. I shall, however, mention the four groups into which they are primarily divided.

If you look at the figures of beetles shown on Plate VIII., you will observe that every

leg terminates in a claw, and that immediately behind this claw there are a variable number of small joints. These joints form the *tarsus* or foot, and their varying number in different species forms a convenient ground of arrangement. Beetles which have five joints in each tarsus are called *Pentamera*; those with five in the tarsi of the foremost two pairs of legs and four only in the hindmost pair, *Heteromera*; those with four visible joints in each tarsus, *Tetramera*; and those having three, *Pseudotrimera*. There are exceptions to this, as to every other rule; but on the whole it may be accepted as a basis for a primary separation of the species.

Of the species which have five joints to all their feet the first section is devoted to the Carnivorous beetles. The Green Tiger Beetle (*Cicindela campestris*), Plate VIII., Fig. 1, belongs to a genus called by Linnæus, on account of the activity and ferocity of its members, 'the tigers of the insect tribes.' They run and fly with equal facility, and are furnished with tremendous mandibles, from which there is no escape for their prey. The species figured is a very handsome insect,



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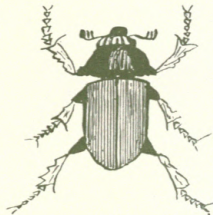
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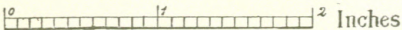
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1. Green Tiger-beetle. 2. Garden Ground-beetle. 3. Plunger Beetle.
4. Devil's Coach-horse. 5. Burying Beetle. 6. Dor Beetle.



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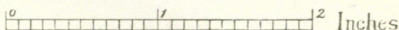
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7. Cockchafer. 8. Reddish Skipjack. 9. Churchyard Beetle.
10. Silvergreen Weevil. 11. Double-barred Longhorn.
12. Sevenspot Ladybird.

bright green with whitish spots, the legs being slender, and of a lovely rosy copper-colour. When flying in the sun, as it loves to do, the green wing-cases and metallic limbs flash and glitter in a manner which arrests the attention. The beetles emit a powerful but not unpleasant scent when captured. They may be found in dry, sandy places—old quarries, sand-pits, and the like.

The Garden Ground-Beetle (*Carabus nemoralis*), Plate VIII., Fig. 2, is a specimen of a group of beetles, which is well known to every one who possesses a garden. In this instance the head and thorax are black, margined with purple, and the wing-cases brassy brown. The ground beetles have become so debased by the chase of crawling things, that they have lost their wings and can themselves only crawl. Their bodies contain a large amount of alkali, so that in Senegal it is said that a kindred species is used for making an efficient soap.

There are many beetles which prefer an aquatic home. The Plunger Beetle (*Dytiscus marginalis*), Plate VIII., Fig. 3, belongs to this class. It is of a blackish-olive colour,

margined with yellow, and inhabits ponds. This beetle will live for a long time in a tumbler of water, feeding on worms or small pieces of meat. It is said to indicate changes of weather by the height at which it stays in the tumbler.

The Devil's Coach-horse (*Ocypus olens*), Plate VIII., Fig. 4, is an ugly insect with an ugly name. It is a type of the great division called *Brachelytra*, or beetles with short wing-cases, the members of which have often a superficial resemblance to earwigs. This one is dull black, with short, matted hair. It hides beneath stones, and when disturbed raises its abdomen in a threatening manner, although it has no sting. Its strong jaws can give a smart bite, which may prove dangerous, if the beetle has recently been making a meal of decaying matter. These beetles act as scavengers to remove putrescent material.

The Burying Beetle (*Necrophorus ruspator*), Plate VIII., Fig. 5, is another which performs this sanitary service. It is black, with orange-yellow bands, and will be discovered under or near the dead bodies of birds or small animals.

The Dor, or Watchman Beetle (*Geotrupes stercorarius*), Plate VIII., Fig. 6, discharges a similar duty in removing dung. It is commonly seen on roads, or paths, and is black above, with grooved elytra, and purplish beneath. A small reddish mite often infests its lower surface, though how it pierces the hard armour of its host is difficult to understand. The Dor-beetle is a near relative of the scarabæus, which the ancient Egyptians held in great reverence, and their degenerate descendants are said to eat.

The Common Cockchafer (*Melolontha vulgaris*), Plate VIII., Fig. 7 (which must not be confused with the cockroach), has a brownish-black head and thorax, clothed with fine white hairs, and wing-cases brownish-yellow. It dwells in trees, where it sometimes does great damage to the foliage. When a chafer falls upon its back, the shape of its body causes it to experience much difficulty in righting itself. In Sweden they say that he who helps one of these insects to regain its feet, will have his sins forgiven. By this saying the Swedes remind themselves that to return good for evil, and to

show kindness to the weak and helpless, are virtues of great merit.

The last of the five-jointed beetles which I can mention is the Reddish Skipjack (*Athoïs hæmorrhoidalis*), Plate VIII., Fig. 8, a chestnut-brown beetle frequently seen in woods and at the edges of fields in Spring. The name 'skipjack' is derived from the peculiar habit of the insects, which, when they happen to fall upon their backs, regain their proper position by springing lightly into the air, somewhat after the manner of a shrimp on the seashore. The destructive wire-worms are the grubs of a species allied to this one. The fireflies of the tropics are members of the same group.

The *Heteromera* are a much smaller division of the beetles, although many of the species are interesting. I have chosen the Churchyard beetle (*Blaps mucronata*), Plate VIII., Fig. 9, as a type. It is dull black, and found in cellars and outhouses. Another species of the genus which is very common in Egypt is said to be cooked with butter and eaten by the women to impart the stoutness of person which is there the standard of

beauty. These beetles are most tenacious of life. I had a specimen of the Churchyard beetle sent to me recently, which had been accidentally packed in a young lady's box when she left Egypt three months before. When I received the insect it was still quite lively, in spite of its long fast. The curious Oil beetles (*Meloe*), which have one of the strangest of life histories, and the green blistering beetles, commonly called 'Spanish flies,' belong to the Heteromera.

The beetles with four-jointed feet are a numerous group. Two of their most important divisions are the Weevils and Long-horns. I shall take a specimen of each. The members of the first are readily recognized by the beak or snout, which projects in front of the head, and to which the antennæ are attached. The magnificent Diamond Beetle of Brazil is a weevil. The specimen which I have chosen, although small and not so brilliant, resembles in a minor degree that glory of tropical America. It is the Silver-green Weevil (*Phyllobius argentatus*), Plate VIII., Fig. 10, a tiny beetle about a quarter of an inch in length. It is

black, coated with brilliant green scales with a silvery sheen, and pale erect hairs. Its legs are yellowish. It is found on oak leaves, often in swarms. It makes a beautiful object under the microscope.

The Long-horns are represented by the Double-barred Longhorn (*Rhagium bifasciatum*), Plate VIII., Fig. 11. It is brownish-black with two yellowish-brown bars upon the wing-cases. It feeds upon decaying trees in the autumn. The species of this group are exceedingly numerous in the hotter parts of the globe, where they find immense quantities of fallen trees on which to feed. As travellers have scarcely done more than penetrate some of the largest of African and South American forests, we may expect that our knowledge of the long-horned beetles will be largely increased after a more minute inspection of these great woods.

The *Pseudotrimera* are mostly beetles of small size. The Sevenspot Ladybird (*Coccinella septempunctata*), Plate VIII., Fig. 12, is a familiar friend. It has a black head and thorax, and red wing-cases, with seven black spots upon them. It is an insect of much

assistance to man, in respect that it destroys aphides or blight. It emits a drop of brown fluid, when taken in the hand, and this used to have a high repute as a cure for toothache. The reputation of this specific probably rested upon the general principle of old wives' nostrums, that whatever is nasty must be good, and the nastier the better.

Along with the beetles one naturally considers the *Orthoptera*, or Straight-winged insects. These are no favourites. With a few exceptions they have neither beauty of form nor colour, and many of them are highly destructive or disagreeable. Whatever beautiful or extraordinary forms there are amongst them, are limited to warm climates, where they are very common. Our British species are almost invariably plain, not to say ugly. They are, however, familiar enough—some only too familiar. The locust, for example, is such a scourge in the lands where it abounds, that it has been deemed the appointed agent to execute the divine wrath upon erring mortals. The cockroaches, which swarm in our kitchens and bakehouses are amongst the pests of civilization.

The earwigs are also extremely disagreeable, although all that is said about them is not true. It is not quite certain that we should include them in this Order. Their position has been changed more than once. Linnæus regarded them as beetles; some naturalists would set them apart in an Order by themselves; others assign them a place among the *Orthoptera*. The mantis and the stick- and leaf-insects of foreign countries, the crickets and grasshoppers of our own land, are all well-known members of the group. If the Order has been somewhat neglected by amateurs, the reason for such neglect cannot be unfamiliarity with the species comprehended within it. These fall conveniently into three groups according to their mode of progression—those which run (*Cursoria*); those which walk (*Gressoria*); and those which leap (*Saltatoria*).

The Common Earwig (*Forficula auricularia*), Plate IX., Fig. 2, needs no description. Any one may get a specimen in a few minutes. It feeds on decaying vegetable matter, and is most active at night. The origin of the name has been much discussed.



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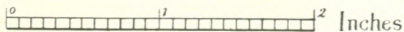
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1. Lesser Earwig. 2. Common Earwig. 3. Common Cockroach (male).
 4. Common Cockroach (female.) 5. German Cockroach.
 6. Parallel Grasshopper.



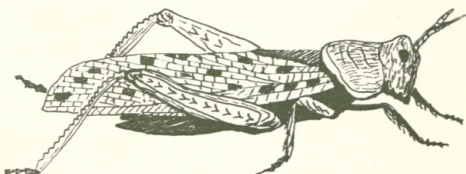
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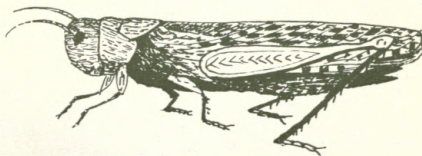
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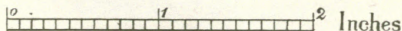
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7. Parallei Grasshopper (female). 8. Two-spot Grasshopper.
9. Spotted Grasshopper. 10. Migratory Locust.
11. *Pachytylus cinerascens*.

One theory derives it from the insect's alleged habit of seeking an asylum in the human ear; another from the fact that the wings are shaped like an ear. That the earwig does invade the human ear cannot be doubted. I myself was told by a medical man that he had more than once removed from thence a dead earwig. Of course, the stories of their penetrating the brain are old wives' fables. Apart from the discomfort caused by such lodgers, there is no harm which can result from their invasion. Another species, much rarer, the Lesser Earwig (*Labia minor*), Plate IX., Fig. 1, may be distinguished from the other by its small size. It must be remembered that amongst insects, difference of size usually implies difference of species, because *an insect never grows after it has attained its perfect form*. Thus the lesser earwig would never grow to be as large as a common earwig. It is one point to be placed to the credit of the much-abused earwigs, that the mother attends to her eggs until they are hatched, and to the young after they emerge. This trait is rare among insects.

The cockroaches are most unpleasant

creatures. They are improperly called 'black beetles,' as I already mentioned, seeing that they are coloured dark brown, and are not beetles. They swarm in our houses, and destroy more food by their contact than they consume. Their shape is admirably adapted to their mode of life, fitting into cracks and crannies, but it is not calculated to please the eye. They were introduced into our country when ships began to visit foreign lands. There are several sorts already established among us, and with the spread of commerce, there is no reason why there should not be many more.

The Common Cockroach (*Blatta orientalis*), Plate IX., Fig. 3, is diffused over the country as far as Shetland. The male and female differ in respect that the former has ample wings, while the latter is practically wingless. Many creatures feed upon cockroaches. I remember that on one occasion a cockroach had been killed and thrown out. One of those long-legged phalanger spiders, resembling a 'daddy long-legs,' was seized with a desire to obtain possession of the body. The cockroach was many times larger than the spider, but

the latter was not to be beaten. It placed itself above the body, with its eight long, thin legs spread out like the shear-legs used for lifting weights at ironworks. Then it lowered its body until it was able to take hold of the cockroach with its jaws. Having got a firm hold, it slowly raised itself, until it lifted the insect off the ground, and setting its legs in motion, carefully bore away its load. It was a remarkable example of the power of a spider to apply its mind to the solution of a difficult problem. It can hardly be said that these phalangers are constantly in the way of raising and bearing off such heavy and unwieldy objects, or that its limbs are specially adapted to act as a shear-legs, when the occasion arises. I prefer to think that the spider coveted the object, and applied some form of reasoning to the determination of the method most likely to attain the purpose.

The German Cockroach (*Phyllodromia germanica*), Plate IX., Fig. 5, may be recognized by its smaller size, and the presence of two dark bands on the thorax. In palm-houses one occasionally sees the large Ship Cockroach (*Periplaneta americana*) and the

Australian Cockroach (*Periplaneta australasiæ*). Certainly one would not desire to see them in his dwelling-house.

The grasshoppers are the most pleasant members of the *Orthoptera*. The mere mention of the name recalls to us the sensation of lying on thyme-scented downs on a hot day, when the air resounds with the chirping of these insects. There are many species.

The figures of the Parallel Grasshopper (*Stenobothrus parallelus*), Plate IX., Fig. 6, may be used to illustrate two common species besides itself—the Green Grasshopper (*Stenobothrus viridulus*) and the Two-shade Grasshopper (*Stenobothrus bicolor*). In shape and size the three are similar. *Parallelus* is of varied colour, green or reddish, and is found in fields and damp meadows. It may be known by having mere rudimentary wings. *Viridulus* is green varied with darker, and is to be sought on inland grassy banks. It produces a loud and prolonged note, beginning low and rising by degrees. *Bicolor* is green, brownish, or yellowish, and inhabits sea-banks and links. It chirps with a sharp ‘tzz, tzz, tzz.’ The Spotted Grasshopper (*Gomphocerus maculatus*),

Plate IX., Fig. 9, frequents grassy banks both coast and inland. It may be distinguished by its smaller size, spotted appearance, and the clubbed tips of its antennæ.

Fortunately for our farmers, locusts do not come here as residents, but as stragglers. I have figured two, not that I expect my readers to find them in their first season, but because there is no saying where they will appear next, and it is very desirable that if a locust should chance to be captured in Britain, we should know which it is. The Migratory Locust (*Pachytylus migratorius*), Plate IX., Fig. 10, and a closely-allied species, *Pachytylus cinerascens*, Plate IX., Fig. 11, are both grey or yellow, and only differ in colour in so far as the hind legs of *migratorius* are partly yellowish and those of *cinerascens* partly reddish. If a locust is captured in any part of this country, it ought to be sent for identification to some one who has studied the Order.

There is a genus of small grasshoppers of very peculiar shape. As examples I shall take the Two-spot Grasshopper (*Tettix bipunctatus*), Plate IX., Fig. 8, and the Subulate Grasshopper (*Tettix subulatus*). They are both found among

dead leaves, and also on bare spots among heather some height above sea-level. The former may be known by having two distinct triangular marks upon its back, and by its greater stoutness and smaller wings. It is the more common.

In this chapter we have been concerned with 'creeping things'; for, although most of the insects I have mentioned possess wings more or less developed, and many of them are powerful fliers, that contemptuous expression is the term by which these creatures are commonly characterized. And yet, I think enough has been said to show that much instruction and profit are to be derived from the study of this despised branch of creation. Both groups make interesting subjects for a collection, and afford a subject of study, in which there is room for almost unlimited individual effort and research.

SOME BOOKS UPON BEETLES AND ORTHOPTERA

1. *British Beetles*. Rev. J. G. Wood. 3s. 6d.
2. *A Catalogue of the British Coleoptera*. D. Sharpe. 2s. 6d. net.
3. *Common Objects of the Country*. Rev. J. G. Wood. 3s. 6d.
4. *Manual of British Coleoptera*. J. F. Stephens. (Out of print).

5. *British Beetles*. E. C. Rye. 9s. net.

6. *British Beetles*. S. L. Mosley (*Naturalists' Journal*, vol. vii.).

7. *The Coleoptera of the British Islands*. Rev. Canon Fowler. £4 net.

8. *British Orthoptera*. Malcolm Burr (*Naturalists' Journal*, vol. vi.). (Also published in book-form.)

CHAPTER VI

DRAGONFLIES AND TWO-WINGED FLIES

IF the *Cicindelidæ*, according to Linnæus, may be called the tigers of the insect tribes, the dragonflies may be termed the hawks. They are types of predaceous creatures. They have long, slender bodies, contrived to present the least resistance to the air; wide-spread, tapering wings, adapted for flight, forward, backward, or sideways at pleasure; and large eyes, set prominently in the head, so as to command a wide prospect in every direction. Their fierce rush through the air forebodes death to all smaller insects which come in their way. One is appalled to think what the position of man himself would have been, had there existed animals of large size, with the powers of dragonflies in proportion. Under these conditions the human

race must have perished in the struggle for existence. As it is, dragonflies are perfectly harmless, so far as human beings are concerned, for they neither bite nor sting.

Dragonflies are termed, scientifically, *Odonata*. They are regarded by some naturalists as an Order by themselves; but most consider them as a section of the *Neuroptera*, or Nerve-winged insects. They certainly form a most interesting group. The metallic hues of their bodies and brilliant glitter of their wings; their powerful yet graceful flight; their wonderful life history, at one time inhabiting the water, at another the air—all combine to make them a fascinating subject of study. The fact that they are by no means easy to catch, adds an element of sport. Of late years, especially since the publication of treatises on the *Odonata*, more attention has been devoted to the study; but there is still room for original research.

When I think of dragonflies, I always associate them with a favourite haunt. It is a small lake, black and still, covering about a couple of acres, and lying at the foot of a hill clothed with Scotch fir and larch. The

lake itself is in the midst of a fir wood, but fringed with alders and light-green bushes, which reflect themselves in the dark pool. Around the shore runs a broad belt of rushes. Standing here on a hot day in July, the sun shining brightly on the surface of the water, one witnesses a remarkable exhibition of dragonflies.

A number of delicate *Agrioninæ* are flitting about the stems of the rushes, resembling nothing so much as wisps of crimson, blue, or grey ribbon fluttering in the wind. Through these, with a wild rush, comes one of the powerful *Æschninæ*—nearly three inches long and four across the wings—scattering the smaller species, like a liner amongst a fleet of yachts. The scene forms a picture, which once seen is never forgotten. Our home species are, however, far surpassed by those of the tropics, which have wings, green, blue, red, or glittering like gold filigree.

I have already said that part of a dragonfly's life is spent under water, and part above it. The egg is deposited in a pond or stream. From this egg the larva comes forth, and spends from nine months to three

years grubbing about the bottom, devouring every living thing of reasonable size with which it comes in contact, and not even sparing its own kindred. The nymph, or pupa, unlike that of a butterfly or beetle, is not motionless, but continues the voracious habits of the larva. At last, some sunny morning it crawls up the stem of a water-plant, and splitting its skin emerges as a dragonfly.

Thenceforth the dragonfly sweeps the air in search of prey, as its fabulous namesake was said to scour the earth.

All this process may be observed in one's home. For this purpose, a vessel containing water and aquatic plants should be provided, and a few of the larvæ placed in it. They can then be fed with worms, or small water insects.

The interest and amusement, which will be derived from watching their curious habits, will amply repay the trouble of attending to their wants.

The species having no satisfactory English names, I shall use the Latin ones. The first specimen, and a type of the true dragonflies,

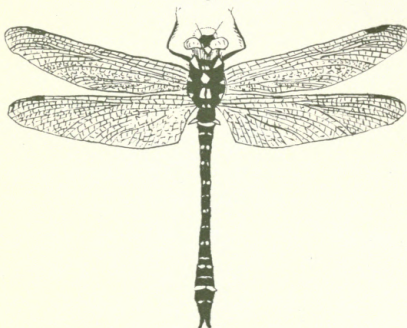
is *Libellula quadrimaculata* (Plate X., Fig. 1). It is reddish-brown with orange spots. The tip of the abdomen is black. The wings are tinged with yellow at the base, and each bears two black spots. The insects are found near ponds, and present a particularly brilliant appearance, the dark patches and golden tinge on the wings imparting richness to their brightness.

Libellula depressa is similar, but larger, and the abdomen flatter. The female is yellow, and the male has a quantity of bluish dust scattered over the abdomen. The wings have not the black spots near the middle seen in the former species, but only one near the tip of each.

These two dragonflies are called 'horse-stingers' by country people, although they can no more sting than the rustics themselves. It is strange how those who are in the constant habit of seeing insects are generally inaccurate in their observations. One learns little by mere seeing, if he does not apply his mind to appreciate the meaning of what he sees. For generations men, who have daily seen this dragonfly every summer



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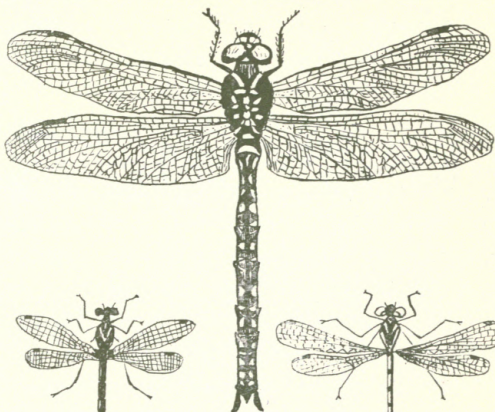
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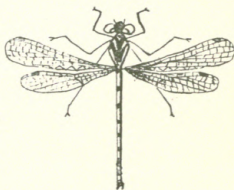
1. *Libellula quadrimaculata* 2. *Sympetrum scot cum.*
 3. *Cordulegaster annulatus.*



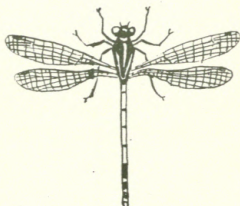
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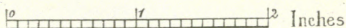
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4. *Æschna juncea*. 5. *Ischnura elegans*. 6. *Enallagma cyathigerum*.
7. *Pyrhosoma nymphula*.

of their lives, persist in accusing it of a practice of which it is perfectly innocent.

Another species bearing some resemblance to *quadrinaculata* is named *Sympetrum scoticum* (Plate X., Fig. 2). The male is purplish-black, with yellow stripes and spots; the female, reddish. It frequents ponds and marshes, and is more abundant in the North than in the South, although it is by no means restricted to Scotland, as its name would suggest.

I now come to some large and splendid dragonflies. *Cordulegaster annulatus* (Plate X., Fig. 3) is black, spotted with yellow. It may be found near streams, especially at rocky places, often in large numbers, but generally flying within a limited area. *Æschna juncea* (Plate X., Fig. 4) is not unlike the last species. The male is brown, with blue and yellow spots; the female brown, with yellow and greenish-yellow spots. The upper edges of the wings are golden, and the blue spots at the extremity of the abdomen divided. It flies in woods and at ponds. Another dragonfly, *Æschna cyanea*, is apt to be confused with the last one, but

may be distinguished by observing that the upper edges of its wings are black, and that the blue spots at the extremity of the abdomen are unbroken.

Three specimens must suffice for the more delicate species. They are all found near ditches or ponds, or in damp meadows, and have a much slower flight than those I have been describing. *Ischnura elegans* (Plate X., Fig. 5) has a black thorax, with blue lines above, yellowish below; abdomen black, with two blue spots, and yellow below; and the wings with yellow spots. *Enallagma cyathigerum* (Plate X., Fig. 6) is blue in the male, greyish green in the female, both spotted with blackish-bronze. It is a very pretty insect. *Pyrrhosoma nymphula* (Plate X., Fig. 7) is carmine red, with black spots. The female may be recognized from her greater stoutness and blackness.

I once had an opportunity of watching the business-like manner in which one of these graceful creatures clipped the wings off a fly, which it had captured and intended to devour. As it sat on an alder leaf stripping its prey, the delicate beauty of

the insect seemed strangely inconsistent with the apparent ferocity of its actions; yet, after all, the dragonfly was only taking its food in its own way. We are apt to feel on such occasions that the actions of an insect correspond with those of a human being. Energy of movement, which in a human being we should consider savage, is deemed equally savage in the case of the lower organism.

The *Diptera*, or Two-winged flies, differ in most respects from the group I have just been describing. They suck their food in place of biting it; they fly with two wings in place of four; they are mostly of small size and inconspicuous appearance; they are individually numerous and often gregarious; and they are frequently an annoyance, sometimes a terror, to men. In Britain the clouds of flies, which surround and buzz about the head of the wayfarer, are troublesome on a hot day, and stinging gnats, clegs, and gadflies, are worse than troublesome; but they are as nothing to the dipterous hordes of Egypt, or to the mosquito and *tsetse*.

The Philistines were no doubt influenced

by a sense of human impotence in a contest with plagues of this sort, when they personified and worshipped the destroyer of flies under the name of Beelzebub, the Lord of the Fly. We are happy, in so far as we need wage no real war with our *Diptera*. They annoy us, but we do not fear them. Their great number and variety, however, make them a difficult Order to observe and classify; but, thanks to the energy of many workers, the difficulties are being surmounted, and in a few years we may hope to have a catalogue of British Flies as complete as that of any other division of insects.

Students are most at fault in studying the life history of the species. Flies spend their larval stage in places and under circumstances so different from those in which they pass their existence in their perfect state, that it is exceedingly difficult to connect the two conditions. Consequently, there are many species as to which at present we know absolutely nothing, until they appear as fully developed flies. There is one point in their development in which they stand practically alone amongst insects—they are furnished



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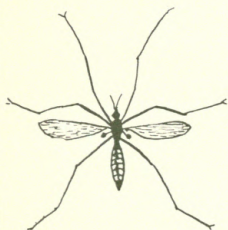
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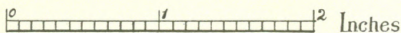
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1. St Mark's Fly. 2. Gnat (magnified). 3. Herb Crane-fly (reduced).
4. Yellow Gadfly. 5. Common Cleg. 6. *Leptis scolopacea*.



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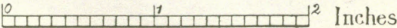
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7. Gooseberry Hoverer 8. Transparent Hoverer. 9. Eristalis pectoratorius. 10. Bluebottle. 11. Bronze Fly. 12. Dung Fly.

with only one pair of wings. They seem to have retained the upper pair of the normal insect, the lower pair being represented by two small objects like drum-sticks, termed *halteres*, or balancers. They will be clearly seen on the figure of the Herb Crane-fly (Plate XI., Fig. 3) just behind the wings. Sometimes, as in the case of the Bluebottle fly (Plate XI., Fig. 10), two ear-shaped lobes are to be observed at the base of the wings. These are called winglets. In other instances, the flea for example, the wings have been lost on account of the parasitical habits of the insect, the disuse of an organ being usually followed by its loss.

I have selected a dozen flies as fairly typical of the Order. St. Mark's Fly (*Bibio marci*), Plate XI., Fig. 1, is jet black. It is one of the blackest insects known. The male has transparent wings, the female blackish. It swarms about hedges in Spring, near the festival of the Saint from whom its name is derived. The Piping Gnat (*Culex pipiens*), Plate XI., Fig. 2, is a tiny but tormenting insect, yellowish-brown, and having its thorax covered with short, golden-yellow hairs. It

has a very long proboscis, and the antennæ of the male are plumed. The Laplanders suffer greatly under the attacks of these insects, of which the mosquito is a near relative. The Herb Crane-fly (*Tipula oleracea*), Plate XI., Fig. 3, is one of those creatures which children call 'Daddy Longlegs.' There are a great number of different species all very like each other; but *oleracea* is one of the most common. It is grey, and its wings are transparent, with brown veins.

In woods one is sometimes startled by the appearance of the Yellow Gadfly (*Tabanus sudeticus*), Plate XI., Fig. 4, which causes more alarm than necessary through its outward resemblance to a hornet. The first time I saw it, I handled it with great care to avoid giving it an opportunity to sting, until I saw that it had only two wings, and therefore obviously did not justify apprehension on that score.¹ It is a handsome fly, black, with yellow bands on the abdomen, and its wings tinged with brown.

A more disagreeable companion of a stroll in fields or woods is the Common Cleg

¹ The figure is drawn from this specimen.

(*Hæmatopota pluvialis*), Plate XI., Fig. 5, which, as its Latin name indicates, is a blood-drinker. It has a motionless flight, and the first indication of its presence is a sharp prick, as it thrusts its proboscis into one's skin. It is grey, the abdomen spotted with black, and its wings variegated. A small but pretty fly, without an English name (*Leptis scolopacea*), Plate XI., Fig. 6, is found on tree trunks. Its thorax is brown, and its abdomen yellow, with brown spots.

The hoverers are so remarkable in their movements, that every one must have observed them at some time. One notices a fly poised motionless in the air, its wings vibrating so fast as to be almost invisible. One draws near to view more closely this odd sight, and it is gone. He looks around, and there is the fly, hovering in a new place, motionless as before! Two examples of these interesting flies are shown. The Gooseberry Hoverer (*Syrphus ribesii*), Plate XI., Fig. 7, is a handsome insect, orange and black, which is common in gardens. The Transparent Hoverer (*Volucella pellucens*), Plate XI., Fig. 8, is black, with the upper portion of the

abdomen transparent, and dark-brown spots on the wings. It is so transparent, that, when it is resting, one can see through its body the leaf on which it stands. It appears in woods.

The Drone Fly (*Eristalis pertinax*), Plate XI., Fig. 9, is brown and yellow, and frequents woodlands. A fly closely allied, *Eristalis tenax*, is known in its larval stage as the 'Rat-tailed maggot.' It takes up its abode in stagnant water, and stretches out a telescopic tube to the surface for a supply of air, thus anticipating some modern forms of submarine boats. This is another of many instances in which human ingenuity has been forestalled.

A familiar pest is the Blue Flesh-fly, or Bluebottle (*Calliphora vomitoria*), Plate XI., Fig. 10, a bright-blue insect, which frequents butchers' shops, and such places in dwelling-houses as are likely to afford it an opportunity of settling upon meat. The House-fly (*Musca domestica*), is too familiar to need a figure. It is grey, and the abdomen is yellowish in the male, and darker in the female. This fly is much exposed to the attacks of parasites and

fungus. The Bronze Fly (*Gymnochæta viridis*), Plate XI., Fig. 11, is not uncommon about walls and hedges in bright sunshine. Its brilliant metallic green body, with bronze reflections, shines with dazzling radiance. The Dung Fly (*Scatophaga stercoraria*), Plate XI., Fig. 12, is one of Nature's scavengers. It is of a downy yellow colour. Annoying as flies often are, we must never forget that they generally serve a most useful function in removing matter, which would otherwise pollute the air. If it were not for these flies, and the beetles of similar habits, the country would soon be uninhabitable.

In this chapter there is an illustration of the manner in which Nature preserves an even balance in her several parts. The larvæ or maggots of two-winged flies remove putrescent matter, but, if unchecked, they would soon increase to such a degree as to become noxious. Amongst the checks provided are those powerful insects of prey, the dragonflies, whose voracity tends to keep the swarms of *Diptera* within due bounds. They, in their turn, are restrained by the attacks of birds; and thus, so long as man does not

interfere in his blundering recklessness, the balance of Nature swings fairly even.

SOME BOOKS UPON DRAGONFLIES AND TWO- WINGED FLIES

1. *British Dragonflies*. Editor of *Naturalists' Gazette*. 1s.
2. *Ants, Bees, Wasps, and Dragon Flies*. W. H. Bath. 1s.
3. *Common Objects of the Country*. Rev. J. G. Wood. 3s. 6d.
4. *British Dragonflies*. W. J. Lucas. £1 11s. 6d.
5. *Account of British Flies*. F. V. Theobald. 12s.
6. *The Harlequin Fly*. Miall and Hammond. 7s. 6d.

NOTE.—An important book on British flies is in course of publication by Mr. Verrall, and when completed will fill a blank in our scientific literature.

CHAPTER VII

SAWFLIES AND BEES

EACH Order of insects is distinguished by some special feature. The physical structure of the beetles, the leaping powers of the grasshoppers, the flight of the dragonflies, the vast number of flies, the varied colouring of butterflies, are all matters which arrest attention. In the case of the *Hymenoptera* the impressive character is their social organization. Ants, bees, and wasps in many cases live together in dwellings, built by the joint labour of the community, and with an orderly system of government. The termites afford the only parallel among insects, and outside the insects we must pass to man himself before we discover anything in Nature corresponding to these wonderful assemblies. Of the social insects, the ant is regarded by modern scientists as the most

intelligent, thus confirming the accuracy of observation of the Old Testament writers. Until a comparatively recent period, it was generally assumed that the bee surpassed all insects in intelligence; now it is the ant which takes the lead, and it was to the ant that these old writers sent men to seek counsel.

The *Hymenoptera*, or Membrane-winged insects, fall quite naturally into two divisions. Those furnished with a saw or borer form one group; those bearing a sting form another. The saw or borer is used to make a hole in a leaf or branch for the reception of eggs; the sting, for many purposes in connection with the building of nests and combs, its aid as a defence being, no doubt, a secondary service to the insect. The two divisions are known scientifically as *terebrant* and *aculeate* hymenoptera respectively. The *terebrant* species vary as regards their method of feeding, some feeding on plants and others on insects. This circumstance enables us to subdivide them into *phytophagous* and *entomophagous* hymenoptera. The sawflies and bees belong to the *terebrant-phytophagous* and the *aculeate* divisions.

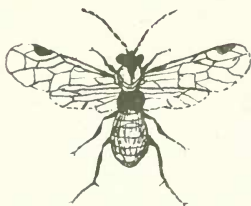




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1. *Perineura solitaria*. 2. *Dolerus pratensis*. 3. *Taxonus equiseti*.
4. *Nematus septentrionalis*. 5. *Nematus ribesii*.



6.



7.



8.



9.

6. *Cimbex femorata*. 7. *Abia fasciata*. 8. *Sirex gigas*.
9. *Sirex juvencus*.

Many persons, who have a fair knowledge of the common insects, do not know the sawflies. In appearance they are not unlike two-winged flies or bees. From the former they can be distinguished by their having four wings, and from the latter, by the lack of a sting. The first seven species which I propose to describe are true sawflies, and belong to that section which is furnished with a saw; the other two are *sirices*, and belong to that which is furnished with a borer. As already said, both saw and borer are employed in making cavities for the reception of eggs. I have figured female specimens only, as those are most commonly seen. All the figures are drawn larger than life, with the exception of 6, 8, and 9, which are less than life. The average length is given in lines, or twelfth parts of an inch; but the sizes of individuals of the same species are not at all uniform. Very few sawflies have English names.

A typical sawfly is *Perineura solitaria* (Plate XII., Fig. 1). It is $3\frac{1}{2}$ lines in length, shining black, with yellowish-white spots on the thorax, and reddish bands on the abdomen.

It should be sought for among herbage in May and early June. *Dolerus pratensis* (Plate XII., Fig. 2) is $3\frac{1}{2}$ lines in length, has the head and thorax black, part of the head and the abdomen red, and the wings with a blackish tinge. It is found among the plants called horsetails in June and July. *Taxonus equiseti* (Plate XII., Fig. 3) is $3\frac{1}{2}$ lines in length, shining black, with some red on the abdomen, the wings clear with the exception of a black spot near the tip of each forewing. It appears in June. *Nematus septentrionalis* (Plate XII., Fig. 4) is $5\frac{1}{2}$ lines in length, shining black, covered with fine but dense pile, and the middle of the abdomen is reddish-brown. It flies in May and June.

One of the commonest and best known species is the Gooseberry Sawfly (*Nematus ribesii*), Plate XII., Fig. 5, which is found in gardens. The fly is three lines in length, yellow, with black spots on the thorax. It is one of the worst pests in our gardens. Its larvæ are the little caterpillars, pale green with black dots, which strip the leaves off gooseberry bushes. Various plans for their

destruction have been devised. The young larvæ are easily found by the holes they make in the leaves, and the surest method is to press these with the fingers and kill them. The application of powdered hellebore is the next best mode. If not eradicated, they will utterly ruin the fruit, as the berries do not ripen properly, when the foliage has been destroyed.

My next two examples belong to a distinct division of the sawflies sufficiently indicated by the knobs which terminate their antennæ. Except among butterflies and sawflies this formation is very rare. Undoubtedly it implies an important structural difference, but, as we do not know the true functions of the antennæ, we are unable to state with certainty what the difference may be. *Cimbex femorata* (Plate XII., Fig. 6) is a large insect, nine lines in length, black, with a black or brownish pile, and wings clear save for a blotch upon each forewing. It may be met with in woods during June or July. At the same season we may find *Abia fasciata* (Plate XII., Fig. 7), a brassy-black fly, $5\frac{1}{2}$ lines in length, its abdomen smooth and shining,

and its wings clear, with a large blotch on each forewing.

The two *sirices* have, as I said before, a borer in place of a saw.¹ They are inhabitants of pine forests, and, as they fly, hum like bees. They are not common in Britain. Their larvæ remain concealed in solid timber for years, and the flies have been known to come to maturity and emerge after a tree has been sawn into planks, and the planks have been laid as flooring. The Giant Sirex (*Sirex gigas*), Plate XII., Fig. 8, is fourteen lines in length, yellow, with two black spots on the abdomen. The male may be distinguished by observing that its abdomen is triangular and the tip black. The Pine Sirex (*Sirex juvencus*), Plate XII., Fig. 9, is fifteen lines in length, violet black, shot with blue—a very handsome insect. Both may be sought for in pine woods, or near woodyards, as they are often introduced to this country in foreign timber.

Next to the white butterflies, the humble

¹ The name *wood-wasp*, improperly, but not unfrequently, given to these insects, is most misleading, as they are not related to the wasps in any sense, except that both are *Hymenoptera*.



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12.

7. *Bombus agrorum*. 8. *Bombus venustus* 9. *Bombus smithianus*.
 10. *Psitnyrus rupestris*. 11. *Megachile centuncularis*.
 12. *Andrena albicans*

or 'bumble' bees are the insects best known to the young. Most people, however, leave the matter at that stage. Comparatively few are aware that in Britain there are over two hundred different sorts of bees, without counting those cultivated by bee-keepers. As boys we recognized three distinct sorts, the black-and-white humble, the red-hipped, and the golden-yellow. In Scotland these are called 'garreck,' 'red-end,' and 'foggie' bees—'fog' in Scotland meaning moss.

The figures on the plate represent in every instance the female bee. The males are generally smaller. I shall mention the average size in each case, expressed in lines, but bees are exceedingly variable in dimensions, and may not always agree with the measurements which are here given.

I shall first deal with the humble bees. These nest in the ground at a greater or less depth from the surface. Sometimes they take possession of the nests of small birds. The communities vary in number from two or three score to two or three hundred. The wax and honey which they prepare is inferior to that of the hive bee, but boys find it

sufficiently agreeable. The females survive the winter, and their first care in early Spring is to lay the foundation of a new nest. *Bombus terrestris* (Plate XIII., Fig. 1), sixteen lines, is a common species. The female has the thorax black, with a yellow band in front, and the abdomen belted in black, yellow, black, and white. The male has the thorax black, with yellow bands in front and behind, and the abdomen yellow, black, and white. It is important to observe the order of these coloured bands. *Bombus hortorum* (Plate XIII., Fig. 2), nineteen lines, has the thorax black, with yellow bands before and behind, and the abdomen yellow, black, and white. Both sexes are similar. The female of *Bombus latreillellus* (Plate XIII., Fig. 3), eighteen lines, has the thorax black, with a yellow band before and a white band behind, and the abdomen black and white. The male has the thorax black, with yellow bands, before and behind, and the abdomen belted with black, narrow white, black, and yellow.

The 'red-end' humble bees come next. *Bombus lapidarius* (Plate XIII., Fig. 4),

sixteen lines, derives its name from the circumstance that it places its nest in stony or gravelly banks. The female is entirely black, except the red tip of the abdomen; the male has a yellow edging to its thorax. In *Bombus lapponicus* (Plate XIII., Fig. 5), fifteen lines, the female has the thorax black, with a yellow band in front, and a narrow yellow band behind, and the abdomen red, with a thin black band above. The male is similar, but has the thorax edged with yellow. A favourite haunt of this bee is a pond fringed with water trefoil (*Menyanthes*) in flower. *Bombus pratorum* (Plate XIII., Fig. 6), fourteen lines, has in both sexes the thorax black, with a yellow band in front, and the abdomen yellow, black, and red.

The next three bees are easily known by their yellow, woolly appearance. In *Bombus agrorum* (Plate XIII., Fig. 7), fourteen lines, the female is bright tawny yellow, and the abdomen more or less sprinkled with black hairs; the male is the same, but has the abdomen banded with grey and black. *Bombus venustus* (Plate XIII., Fig. 8), fourteen lines, resembles the last bee, but the

hairs are shorter and more even, and there is no black on the abdomen. *Bombus smithianus* (Plate XIII., Fig. 9), sixteen lines, is met in Orkney, Shetland, and the Hebrides. The thorax is bright fulvous, and the abdomen lemon-yellow. The male merely has a brighter shade of yellow in the abdomen.

The next bee, *Psithyrus rupestris* (Plate XIII., Fig. 10), eighteen lines, is a member of a genus which makes no nest, but shares the nests of other bees. *Rupestris* is a guest of the red-end bee *lapidarius*. It is not known what benefit, if any, these lodger bees confer on their hosts, but we may assume that they are 'paying guests.' The bee is black, with its abdomen orange-red. Another genus of bees, named *Megachile*, is remarkable for lining its nest with sections neatly cut from the leaves of roses and other bushes. Having selected a hole in a decaying post or tree, a bank, or an old wall, the female bee, with marvellous skill, bites out of the leaves portions of varying size and shape, exactly calculated to form the cells which she desires to construct. Her

operations are a study in the capabilities of instinct. I have chosen as an example of this genus *Megachile centuncularis* (Plate XIII., Fig. 11), ten lines, a little bee having the thorax closely punctured, and clothed with fine, golden-brown hairs, and the abdomen grey and black. The bees of the genus *Andrena* appear very early in the year. *Andrena albicans* (Plate XIII., Fig. 12), eleven lines, has the thorax fulvous, the abdomen shining and punctured, with golden hairs at the tip, and the apex bright red. The male is smaller and more slender.

Before closing this chapter it is necessary to advert to the important functions in relation to the reproduction of plants discharged by bees and some other insects, particularly the former. It is now well known that many plants would not produce seed, and, therefore, would not reproduce themselves, without being fertilized by the transfer of pollen effected by visits of bees. This is a wonderful truth. If bees did not seek honey and pollen in the way that they do, many beautiful flowers and useful plants would become extinct. We ought, therefore,

to reflect, when we see bees flying from flower to flower, that they are not merely engaged in providing for the preservation of their own species, but are fulfilling a duty which benefits the whole of Nature.

SOME BOOKS ON SAWFLIES AND BEES

1. *British Phytophagous Hymenoptera*. Peter Cameron (Ray Society). In four vols. £1 each.
2. *Ants, Bees, Wasps, and Dragon Flies*. W. H. Bath. 1s.
3. *British Bees*. W. E. Shuckard. 9s. net.
4. *Common Objects of the Country*. Rev. J. G. Wood. 3s. 6d.
5. *Catalogue of Hymenopterous Insects in the Collection of the British Museum*. F. Smith. £1 14s. 6d.
6. *The Hymenoptera Aculeata of the British Isles*. Edward Saunders. 16s. net.

CHAPTER VIII

BUTTERFLIES AND MOTHS

I HAVE kept what is, in my opinion, the best wine until the last. The plants and animals, which have been discussed in the preceding chapters, have each a measure of charm for the student of Nature ; but, as a subject of study, none of them can equal those graceful and delicate insects, which the present Poet Laureate calls ‘the winged flowers of the unsown air.’ There is an element of the ethereal in butterflies, which has from the earliest times influenced poetic minds. If we except the humming-birds, I do not think such brilliance and beauty of colour, elegance and refinement of form, and lightness and grace of movement are combined in equal degree in any other portion of the animal kingdom.

There have been times when these

attributes have been despised. In the eighteenth century the censors of public taste held that the proper study of mankind was man. It need, therefore, excite no surprise when we find even Goldsmith in his *Animated Nature* writing about butterflies in this fashion: 'It has been the amusement of some to collect these animals from different parts of the world, or to breed them from caterpillars at home. These they arrange in systematic order, or dispose so as to make striking and agreeable pictures; and all must grant that this specious idleness is far preferable to that unhappy state which is produced by a total want of employment.' Specious idleness indeed! How little he knew of the true delights of collecting and studying these lovely insects! Hear one who, although he did not aspire to the literary standing of Goldsmith, was a far better naturalist. In his *Naturalist on the River Amazons*, p. 353, Mr. Bates sums up his theories in these prophetic words: 'The study of butterflies—creatures selected as the types of airiness and frivolity—instead of being despised, will some day be valued as one of the most important branches

of Biological science.' This emphatic statement of one, whose lightest word commands and deserves attention, should make us pause ere we speak in a supercilious manner regarding the study of butterflies, or, indeed, of any group of animals, however humble they may seem to us. There are mysteries in Nature, as to which no man can foretell where we may find a clue leading to a knowledge of their secrets. With all deference to, and admiration for, the labours of Darwin and others, we are bound to admit that the origin of species is still a secret, and likely to remain so. It is, however, generally recognized that if the riddle can be read by human ingenuity, the key is most likely to be found in study of the lower organisms. Every one, therefore, who labours in this field, does so with the possibility that he may make a discovery, which will lead to the elucidation of some difficult problem of natural history.

The use of two terms, 'butterfly' and 'moth,' to designate separate sections of the *Lepidoptera*, is peculiar to English-speaking peoples. Other nations do not use different words for this purpose, but the twofold

division, which such use implies, is everywhere recognized. Its importance is not pressed in modern systems of classification, and, indeed, in the most recent endeavours to reduce the species to a natural order, the distinction has been disregarded. Still, the separation is convenient for many purposes, and particularly useful to the lover of Nature, who is more apt to concern himself with the beauty and interest of the insects, than to adhere to a strict system of classification. As a general rule, butterflies and moths can be distinguished at a glance. The stouter bodies, and the wings folded like a fan, might serve to mark the moths as a group apart from the slender-bodied butterflies, which fold their wings vertically. Unfortunately many moths (especially the geometers) resemble butterflies in this particular, and we must seek a less ambiguous mark of separation. This is found in the structure of the antennæ. Among the moths these assume many forms, but never end in a *distinct knob*; *those of the butterflies are always knobbed*.

It is only necessary, before turning to the consideration of individual species, to repeat

the caution that insects in their perfect state do not grow, and that if we find two butterflies similar in appearance but differing considerably in size, we may assume that they are different species. I have certainly seen considerable differences in size in single specimens. I have two puss moths, one of which is half as big again as the other, but such instances are exceptional. The practical principle is this—a small butterfly will *not* grow into a larger one.

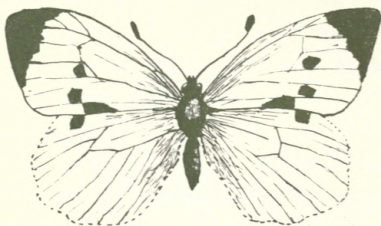
The common white butterflies are old friends. Whether we spent our childhood in town or country, one of our earliest recollections is the sight of those soft, white-winged creatures in the parks and gardens of the one, or in the fields and hedgerows of the other. Next to the birds, they were the largest flying objects we saw, and they became the source of much exciting sport. As we seldom caught them, it is possible that the insects also regarded the pursuit in a sporting way.

I remember, when very young, going out to a field of hay in the early morning and picking the small white butterflies off the

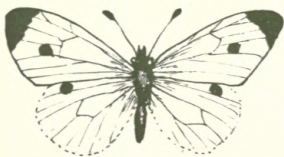
grass stems. I can still remember the peculiar feeling of their wings, something like that of a surface coated with French chalk.

The manner of flight of the white butterflies is very marked. They sail gracefully through the air, rising and falling, but ever going onwards, if they are not absolutely turned by some cause of alarm. In this matter they are unlike the more brilliant sorts, which dart in an irregular way hither and thither, backwards and forwards. Just as the experienced eye, from an inspection of the outline, curves, and general *facies* of a tree, can tell at a long distance what it is, so an observer, who is familiar with the mode of flight of the various species, can recognize certain butterflies long before he is near enough to note their markings.

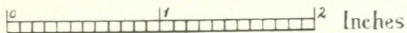
I propose to consider five different butterflies under the general title of 'Whites,' although none of them is truly white, but cream-coloured or orange-tinged. Nevertheless, British collectors have become accustomed to speak of the Pierid butterflies as 'Whites,' and so long as it is understood that the term is not meant to be descriptive,



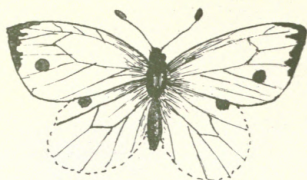
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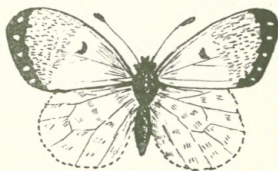
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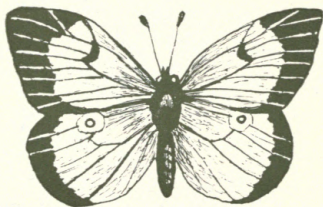
1. Large White. 2. Small White



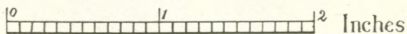
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3. Green-veined White. 4. Orange-tip. 5. Clouded yellow.

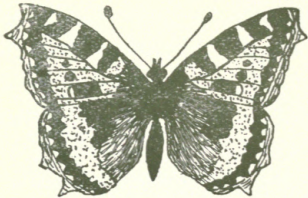
no harm is done by a practice which is otherwise convenient.

The Large White (*Pieris brassicæ*), Plate XIV., Fig. 1, cannot be confused with any other British butterfly. The figure shows the female; the male wants the two black spots and dash on the forewings. It is usually spoken of as a common insect, but in many districts, especially in the North, it is only occasionally met. A more common species is the Small White (*Pieris rapæ*), Plate XIV., Fig. 2, which a beginner readily confuses with the Green-veined White (*Pieris napi*), Plate XIV., Fig. 3. The two butterflies are not unlike on the upper side, but the veins on the under side of the hindwings of the latter are marked by a broad blackish-green edging. The females of each may be known from their having two black spots on each forewing, as well as one spot on each hindwing. The Green-veined White has the power of secreting a scent of considerable power, probably used as an attraction to the opposite sex. The delicate and lovely Orange-tip (*Euchloë cardamines*), Plate XIV., Fig. 4, is found in early Summer

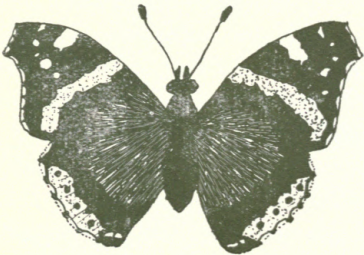
in damp meadows, or in the valleys of mountain streams. It flits among the fresh green verdure in the sunshine, the light beautifully illuminating an orange patch at the tip of each forewing of the male. This patch seems to glow as the insect flits past. The female has no orange patch, but is readily distinguished from other small whites by the green marbling spread over the under sides of her hindwings.

Much rarer than these, although not at all uncommon in some parts, is the Clouded Yellow (*Colias edusa*), Plate XIV., Fig. 5. It cannot be mistaken. The male is orange, with broad black borders, crossed by yellow lines and surrounded by a beautiful rosy fringe; the female is paler, with yellow spots in the border instead of lines. The insect frequents clover fields, and is swift on the wing. If one stalks it cautiously until it settles on a flower, and then strikes with the net rapidly downwards, there is a fair chance of capturing the specimen; but, if the stroke misses, there will be no second chance.

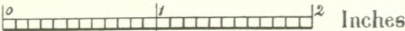
Amongst the more brilliant butterflies, the most common is the Small Tortoise-shell



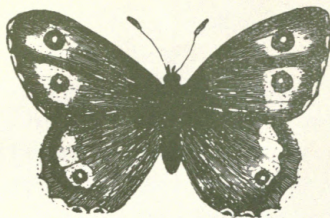
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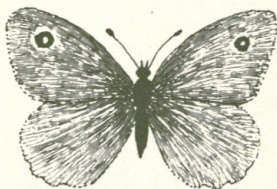
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1. Small Tortoiseshell. 2. Red Admiral.



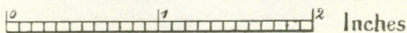
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3. Grayling. 4. Meadow Brown. 5. Small Copper.



(*Vanessa urticæ*), Plate XV., Fig. 1, so called because the colour and arrangement of its pattern are not unlike the markings of tortoise-shell. It cannot be mistaken for any other home species except the rarer Large Tortoise-shell (*Vanessa polychloros*), and the former may always be distinguished by the pure white spot next the tip of each forewing, and the tiny blue crescents which form an edging upon all the wings. Its larger relative has a yellow spot, and the crescents are confined practically to the hindwings. One would fancy that an insect so brightly coloured would fall a prey to the first bird which encountered it; but it is not so. Brilliant as are the hues of the upper surface—red, orange, yellow, white, brown and blue—the lower is painted in sober shades, so as to resemble rough, dark bark. The instant a Small Tortoise-shell alights on a tree or post and closes its wings, it seems to vanish. A like arrangement is found in the case of most bright-hued species, and those which frequent open spaces.

Probably the most radiant of our British butterflies is the Red Admiral (*Pyrameis*

atalanta), Plate XV., Fig. 2. The name is said to be a corruption of 'Admirable,' and, if so, the attribute is justly applied. Its prevailing hues are black and scarlet. Sometimes one sees several of them together, forming a lovely group, the scarlet bands glowing like fire against the velvety-black setting. They are not easily caught. In the long struggle with France this insect was named the British butterfly, in opposition to the Large White which was called French. The comparatively sluggish flight of the latter enabled schoolboys to show their patriotism by killing the Whites with less effort to themselves than if they had to slay Red Admirals.

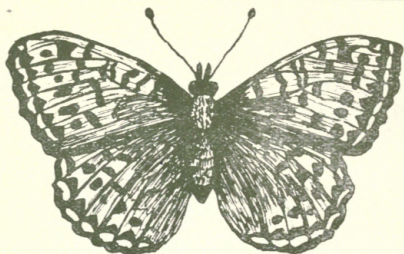
On hillsides and downs near the sea one may seek the Grayling (*Satyrus semele*), Plate XV., Fig. 3. It has no connection with the fish mentioned in Tennyson's *Brook*, its name being somewhat unhappily derived from its colour. It is not grey but brown. It is only when one looks at the under side that he sees the grey tinge which justifies the name. Particular attention must be paid to the eye-spots, as

they are called, the number and position of which are shown on the plate. The females are larger than the males, and in them the shades of brown are more sharply contrasted. This is one of the species I had in mind when I spoke of the protection afforded to butterflies which frequent open spots. Flying in downs without shelter, the grayling is especially exposed to the attacks of enemies, but the grey mottling of the under sides of the wings resembles lichen so closely, that when the insect alights with the wings folded, it is well nigh indistinguishable. I have watched a grayling alight among bents, and have looked for it on all sides in vain, until it suddenly arose among my feet.

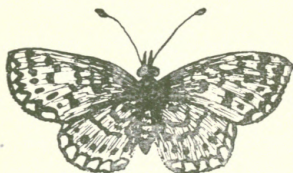
The Meadow Brown (*Epinephele janira*), Plate XV., Fig. 4, is much more abundant. In fact, it is one of our commonest butterflies. I have figured the male. The female has the eye-spot surrounded by a large orange-tawny patch. The extent of brown and tawny on these insects is variable. Several butterflies, which resemble the Meadow Brown, either differ from it in size, or have a larger number of eye-spots.

Along the margins of cornfields, and at footpaths through meadows, one sees the Small Copper (*Polyommatus phlæas*), Plate XV., Fig. 5. The metallic coppery glitter of its wings renders it unmistakable. The glory of the English fens was the Large Copper, but the drainage of the country and the insensate inroads of collectors, who, instead of being content with a pair of specimens, swept them up in dozens, have exterminated this beautiful insect.

A considerable number of butterflies are known to our countrymen as 'fritillaries,' on account of a similarity of pattern thought to exist between them and the flowers of that name. I shall mention three of the commonest of them. The Dark Green Fritillary (*Argynnis aglaia*), Plate XVI., Fig. 1, is not very felicitously named. It is, as indeed they all are, on the upper side reddish-brown spotted with black. On the under side the ground-colour is tinged with green, hence the name. Upon this ground there are numerous large silvery spots. It is a singularly beautiful insect. It shows to greatest advantage during flight, the



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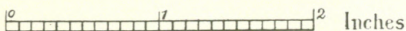
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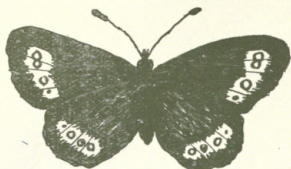
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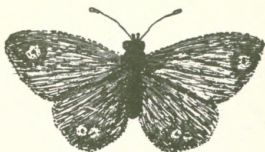
4.



1. Dark Green Fritillary. 2. Pearl-bordered Fritillary.
3. Small Pearl-bordered (closed). 4. Pearl-bordered Fritillary (closed).



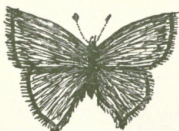
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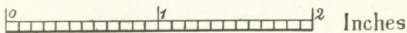
6.



7.



8.



5. Scotch Argus. 6. Large Heath. 7. Small Heath.
8. Green Hairstreak.

glittering spots below contrasting with the rich warm tint above, as it flies about in the sunshine. It is found on heaths and in woods.

I remember one little dell in Perthshire, where a stream came tumbling over a low rock face, and flowed on between a heather bank on one side and a line of alders on the other. In this secluded spot a number of these lovely fritillaries were flying up, down, and across, the whole forming a charming picture. This is, in fact, one of the great attractions of the study of butterflies. It leads the student into spots naturally beautiful, and by drawing his attention particularly to the loveliness of one part of the scene, enhances his enjoyment of the whole.

The other two fritillaries to which I have alluded are the Pearl-bordered (*Brenthis euphrosyne*), Plate XVI., Figs. 2 and 4, and the Small Pearl-bordered (*Brenthis selene*), Plate XVI., Fig. 3. As is not uncommon in relation to the names of insects, the adjective 'small' is not to be understood as implying any marked difference in size. *Selene* is certainly, as a rule, smaller than

euphrosyne, but this fact would not be a reliable guide to identity. Neither is the appearance of the upper side of the wings to be depended upon, although an experienced eye can detect points of difference. Both are reddish-brown with black spots. They can be best distinguished by a comparison of the under sides, and to enable this to be done I have drawn two figures with the wings closed. They may be sought upon heaths and in open glades amongst trees, especially at damp places overgrown with rushes.

A few butterflies belonging to Alpine genera are established amongst our mountains. Of these the best known is the Scotch Argus (*Erebia æthiops*), Plate XVI., Fig. 5, which is abundant in localities that suit it. It is so dark a brown that it seems to be black, and is marked with light-russet patches, each containing several eye-spots. The under side bears a streak, which is coloured bluish-ash, but never white. A white streak is the badge of a much rarer insect, the Arran Brown (*Erebia ligea*).

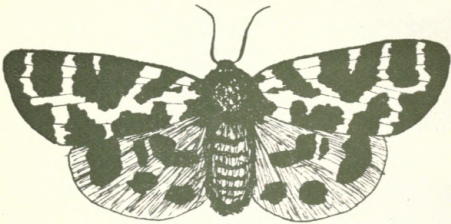
On heaths one meets two very similar

butterflies—the Large Heath (*Cænonympha typhon*), Plate XVI., Fig. 6, and the Small Heath (*Cænonympha pamphilus*), Plate XVI., Fig. 7. Both are tawny, but the former is larger, and bears one or two indistinct eyespots on each wing, while the latter has only one near the tip of each forewing. Specimens of the Large Heath vary greatly in the number and distinctness of the spots. Both are sluggish fliers and easily taken. In company with the Small Heath is usually to be seen the Common Blue (*Lycæna icarus*), which I have not figured, as it is so well known. Every one must have observed this little lilac-blue butterfly flying across downs, or banks by the roadside, over the harebells, and looking as if some of the blossoms had become instinct with life. The strong tinge of lilac in its colour serves to distinguish the male, at any rate, from other blues. The female is brown rather than blue, with a row of small red spots at the edge of the wings. About the same size as this Blue is the Green Hairstreak (*Callophrys rubi*), Plate XVI., Fig. 8. It is brown above and bright green with a white streak beneath.

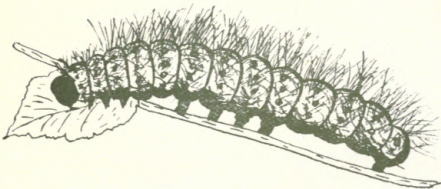
The crude green of the under side prevents its being mistaken for any other butterfly. It frequents the edges of woods, and, on account of its dull colouring, may easily be overlooked.

The group of Moths is a very numerous one, and it is my intention to mention only selected specimens representing important sections. I shall pass over the hawkmoths, so called from the shape of their wings, although these include the largest British member of the *Lepidoptera*—the Death's-head moth (*Acherontia atropos*). This large insect measures five or six inches across the wings, and bears on its thorax what resembles a representation of a skull. The moth is never common, but there are few parts of the kingdom in which a specimen does not occur from time to time. A figure of it would be too large for my plates, and I have thought it better to confine my remarks to species of a smaller size, which are more widely distributed.

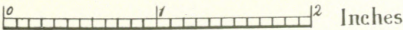
The species of a large and important section are known to British collectors as 'Tigers.' This is not, as in the case of the



1.



2.



1. Tiger. 2. Tiger (larva)



3.



4.



5.



6.



Inches

3. Clouded Buff 4. Wood Tiger. 5 Ruby Tiger 6 White Ermine.

tiger beetles, on account of their ferocity, but because of the colour and pattern of the wings of one of the species—the Tiger Moth (*Arctia caia*), Plate XVII., Fig. 1. This is a singularly handsome insect. The colours vary much, but speaking generally, the forewings are dark brown and cream, the hindwings red with blue-black spots, and the abdomen red, while a scarlet collar encircles the neck. So beautiful are the hues, that many persons, who fancy that all butterflies are brightly coloured and all moths dingy, think that it is a butterfly. I have frequently had a tiger moth sent to me as a rare specimen.

This is a very interesting insect to rear from the larval stage. Its larva is the brown, hairy caterpillar called variously ‘woolly bear,’ ‘hairy worm,’ or ‘hairy outhit’ (Plate XVII., Fig. 2). In the early summer these are common everywhere. A few should be placed in an airy box with a supply of fresh plants of the common dead nettle. If this plant is not convenient, they will eat almost any similar plant. I have reared them on the stinging nettle. After certain days, the

woolly bear ceases to feed, and weaves for itself a neat hammock, in which it passes the quiet stage of its life called the pupal period. After a short stay in this condition the moth emerges in full perfection. These arrangements are easily made, and the process can be observed without difficulty.

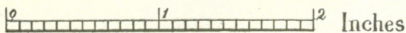
The Clouded Buff Moth (*Nemeophila russula*), Plate XVII., Fig. 3, is another member of the Tiger group. The male has lemon-yellow forewings and yellowish-white hindwings; the female rusty yellow forewings and dusky hindwings. The Wood Tiger (*Nemeophila plantaginis*), Plate XVII., Fig. 4, is a very pretty insect. The forewings are black with cream-coloured markings; the hindwings ochre-yellow in the male and yellowish-red in the female, both having black streaks and edges. It frequents open glades in woods and the borders of heaths. A quaint little moth is the Ruby Tiger (*Phragmatobia fuliginosa*), Plate XVII., Fig. 5. It is difficult to get a good specimen except by breeding it, because the scales are usually removed from the wings during flight. It is reddish brown, with hindwings rosy red,



1.



2.

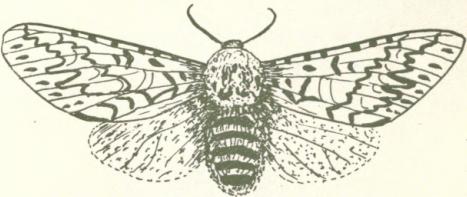


1 Emperor.

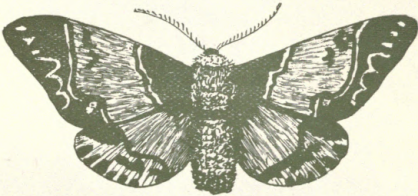
2. Oak Eggar.



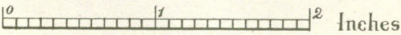
3.



4.



5.



3. Vapourer. 4. Puss 5. Kentish Glory

slightly spotted with black, and the abdomen carmine.

There are two moths called 'Ermines' from a faint resemblance subsisting between their wings and the fur. The White Ermine (*Spilosoma menthastris*), Plate XVII., Fig. 6, has the forewings whitish, with a yellow tinge, and sprinkled with small black spots; the hindwings white, with a black spot in the centre, and two or three at the edge. The Buff Ermine (*Spilosoma lubricipeda*) is so like the other that I have not figured it. The latter species is of a pale yellow spotted with black.

The true Silk Moth (*Bombyx mori*) is not found in this country except in a domesticated state. We have, however, several moths which use silk more or less in the construction of their cocoons. The Tiger Moths are of this sort, and I propose to add five others, all interesting species. No British moth produces silk in a quantity that is of any value from a commercial point of view. The Emperor, or Smaller Peacock Moth (*Saturnia pavonia*), Plate XVIII., Fig 1, is one of the handsomest of the

group. The wings are of a lovely grey and purple, very delicately shaded, and bearing large eye-spots. The male, which I have drawn, may be distinguished from the female by his feather-like antennæ and tawny hindwings. The caterpillar is also very pretty. It is bright green, sharply divided into segments, each of which is marked with a black and pink ring, spotted with yellow, and adorned with little tufts of hair and bristles. It is generally found feeding upon heather. The first time I saw it, I thought I had indeed discovered a prize. It forms a pear-shaped cocoon, ingeniously contrived, so that a number of sharp bristles meet and present their points outwards. They are like the bunch of spears, which the brave Swiss gathered against his own breast. Any small enemy from without would find it impossible to penetrate this close pointed mass, yet the insect within finds it yield without difficulty when necessary.

The Oak Eggar (*Lasiocampa quercus*), Plate XVIII., Fig. 2, is prettier than one would anticipate from the figure. It is of

a rich chestnut-brown, with ochre-yellow bands and white spots. The female is larger and ochre-yellow throughout. The caterpillar is of large size, clothed with light-brown hairs, and banded with velvety black. It feeds on various plants, including heather, and forms an egg-shaped cocoon. I once observed that a caterpillar of this moth, which had been found feeding on cranberry leaves, was most unwilling to feed on heather, although the latter is the more natural food-plant. An insect can apparently acquire a taste as readily as the more noble animal, man.

The Vapourer (*Orgyia antiqua*), Plate XVIII., Fig. 3, is an odd little moth. It is not showy. The male is chestnut-brown, with light spots and dark markings; the female is wingless, and resembles nothing so much as a fat spider. The caterpillar eats the leaves of many plants, including the poisonous laurel. This is one of those moths which are gifted with marvellous powers of communication. If a female Vapourer is placed outside, in a box covered with gauze, and if there are any males within

miles, they will be attracted to her. How it is done is one of the myriad points upon which scientists are ignorant.

The Puss Moth (*Dicranura vinula*) Plate XVIII., Fig. 4, takes its name from its furry appearance. It is light bluish-grey, with black markings. The caterpillar is an extraordinary object—bright green, with white stripes, and furnished with a forked tail, from which, when alarmed, it thrusts two scarlet threads. These are supposed to be used as whips to drive away insect enemies. The cocoon is constructed on the bark of a tree, usually a willow. It is a wonderful structure, composed of chips and gum, and so corresponds with the surrounding bark that it cannot be detected except by a trained eye.

Of all British moths, that nearest of kin to the true silk-moth is the Kentish Glory (*Endromis versicolora*), Plate XVIII., Fig. 5. It is very local in its range. The ground colour of the wings is reddish-brown in the forewings, and tawny yellow in the hindwings. The former are marked with dark and light bands; the latter with dusky lines

and white spots. The female is lighter in hue, the hindwings being almost entirely dull white. I have mentioned this moth, although it is by no means common, because I have reason to suspect that it is more widely distributed than we are aware of, and increased observation will extend our knowledge of its favourite spots. It is only by combined effort that men painfully and slowly arrive at some degree of knowledge on these subjects.

No Order of Insects has so good a record as the *Lepidoptera*. Man suffers occasionally from the ravages of caterpillars, particularly those of certain moths; but apart from this, his associations with these insects are altogether pleasant. If we except the irritation caused by the hairs of some caterpillars when carelessly handled, no butterfly or moth is noxious or hurtful. On the contrary, they are all agreeable to behold, and many of them are exceedingly beautiful. It is scarcely possible to exaggerate the splendour of some exotic species, which combine the richest colouring with the highest metallic brilliance. The *Lepidoptera* may,

166 BUTTERFLIES AND MOTHS

therefore, be fitly characterized as the aristocracy of the insect tribes.

SOME BOOKS ON BUTTERFLIES AND MOTHS

1. *British Butterflies*. W. S. Coleman. 3s. 6d.
2. *British Moths*. J. W. Tutt. 3s. 6d.
3. *Common Objects of the Country*. Rev. J. G. Wood. 3s. 6d.
4. *Guide to Butterflies*. Dr. Knaggs. 1s.
5. *The Book of British Butterflies*. W. J. Lucas. 2s. 6d.
6. *The Butterflies of the British Isles*. Richard South. 6s. net.
7. *Our Country's Butterflies and Moths*. W. J. Gordon. 6s.
8. *Practical Hints respecting Moths and Butterflies*. Richard Shield. 5s.
9. *Butterflies and Moths (British)*. W. Furneaux. 6s. net.
10. *Manual of British Butterflies and Moths*. H. T. Stainton. In two vols. 10s.
11. *Handbook of British Lepidoptera*. E. Meyrick. 10s. 6d.
12. *The Lepidoptera of the British Islands*. C. G. Barrett. In ten vols. 12s. net each.
13. *Handbook to the Order Lepidoptera*. W. F. Kirby. 5 vols. 30s. (Also published in cheaper form by Lloyd, London.)
14. *British Butterflies and Moths*. E. Newman. £1 5s.
15. *Butterflies and Moths of Europe*. W. F. Kirby. £1 1s. net.
16. *Natural History of British Moths*. Rev. F. O. Morris. 4 vols. £3 3s.
17. *British Butterflies*. Rev. F. O. Morris. 15s. net.

NOTE.—It is quite impossible to give a complete list of works on this subject, but there is here given a fairly representative selection.

CHAPTER IX

NOTEBOOKS AND COLLECTIONS

CONCERNING Solomon's knowledge of Natural History we are told that it was wide and varied. 'He spake of trees from the cedar tree that is in Lebanon, even unto the hyssop that springeth out of the wall; he spake also of beasts, and of fowl, and of creeping things, and of fishes.' In the seven preceding chapters I have introduced the reader to information as varied, though not so extensive, as that of the wise king. We have discussed plants, from the royal oak to the lowly scorpion-grass; eggs of birds from the hawk to the wren; and a multitude of flying and creeping things. The time has now arrived for consideration of notebooks to record observations, and collections to preserve specimens.

A naturalist, as has been repeatedly

remarked, is, *in the first place*, one who loves Nature, *and observes*. He may also be a collector, but he is so only in the second place. His first aim is to understand the life histories of the plants and animals, with which a beneficent Creator has surrounded him. To this end he observes and notes the details of their structure, their instincts, and their relations to each other. He is slow to take life, because his object is more likely to be attained by observation of the living plant or animal, than by examination of its dried remains. Thus, observation supported by the use of the notebook is the first means to be employed for learning the secrets of Nature.

Next comes collecting. Observation has to be accompanied by the study of specimens, and it is not only desirable but essential that the student should form a collection for private examination. In making this collection he must spare life as far as possible, retaining no more specimens than he absolutely needs for study. Whole rows of a single species, unless gathered by a specialist for the comparison

of distinct varieties of that species, are a waste of life, of which no true naturalist will be guilty. The student should approach the study in a loving spirit. Then he will derive pure pleasure and increased understanding. In my opinion, the use of the notebook should rank first as a means towards the attainment of a scientific acquaintance with plants and animals.

One of the most useful applications of the notebook is the construction of a Naturalist's Calendar. A good specimen will be found at the end of White's *Natural History of Selborne*. A calendar of this sort notes the dates of the operations of Nature, either for one year, or for an average of several years. In it we record the times of the opening of flowers in our own neighbourhood, the budding of trees, the appearance of insects, and the other events which vary the charms of successive seasons. The making of such a calendar is a work of great utility. It affords excellent training in habits of observation, and the completed work is of much practical use. By means of a list of this kind it is possible to compare the natural history of one district,

or of one season, with that of another. The observer will find his calendar, if kept for a few years carefully and regularly, a source of interest, through the comparisons which he is able to institute by means of it. It is curious to note the variation between the date on which one saw the first primrose, or the first white butterfly, in different years, and it is no less surprising to mark the regularity which prevails in the operations of Nature—each plant and insect and bird arriving true to its appointed time with reference to others.

As an illustration of the form of such a record, I select a few entries from a calendar which I kept for a number of years in Elginshire. I have purposely chosen entries of a varied character—

- Jan. 23. Hive bees flying.
- „ 30. Lilac leaf-buds appearing.
- Feb. 13. Gooseberry leaves opening.
- „ 26. Catkins on willow.
- Mar. 9. Hawthorn leaf-buds opening.
- „ 15. Lilac leaf-buds opening.
- „ 16. First primrose.
- „ 23. Crocuses in full bloom,

- Apr. 5. Sycamore leaf-buds opening.
 „ 9. First small tortoise-shell butterfly
 „ 17. Dandelions in flower.
 „ 18. Wood anemones in flower.
 „ 24. Narcissus and apple blossom.
 May 5. Ladybirds flying.
 „ 6. Tiger beetles flying (*C. campestris*).
 „ 10. Small white butterfly (*P. rapæ*).
 „ 11. Bracken tips uncurling.
 „ 22. Hawthorn in bloom.
 „ 25. Caterpillars of small tortoise-shell butterfly.
 June 2. Dog rose in flower.
 „ 19. Foxglove in flower.
 July 3. Burnet moths flying (*A. filipendulæ*).
 „ 15. Painted lady butterfly (*P. cardui*).
 Aug. 17. Harvest begun on B—— farm.
 „ 21. Leaves turning yellow.
 Sep. 8. Ripe berries on honeysuckle.
 Oct. 5. Autumn tints general.
 Nov. 16. Trees generally bare.
 Dec. 29. Daisies in flower.

Of these entries it may be observed that there is naturally less to note in the closing

months of the year, as compared with those earlier months, when growth is rapid, and objects seem to spring into our notice so quickly that we scarcely know how to make a selection amongst the many things calling for the recording pencil. It is otherwise at the end of the year. We find it easier to mark the first appearance of anything than its last, and when everything is withering and passing away, we do not feel ourselves so much at a loss to choose our entries.

With the approach of a New Year, the preparation of a Naturalist's Calendar may well hold a place among those schemes of work and self-improvement, which we are wont to form at such a time, and which we too often forget immediately the festive season has passed. If once seriously undertaken, there is a fascination about the formation of a calendar, which affords a reasonable hope of the resolution being adhered to. It does not matter how trifling the entries may seem. The main points to be observed are promptitude in making the notes, and accuracy in recording matters of fact. Little purpose is served by writing up entries in the calendar

some days after the occurrences were noticed. The entry should be made at once. If care is taken to record nothing but facts personally observed, to avoid hearsay, and to make immediate records, it is possible to prepare a calendar which will not only be of much interest locally, but will also have real scientific value.

Turning now to collecting, it has to be observed that a herbarium or collection of dried plants, although it can never satisfy the lover of wild flowers, is indispensable to the botanist. A little attention to detail makes all the difference between forming a useful and ornamental collection and a mere congeries of withered shreds. The primary point in collecting plants for preservation is to choose as dry weather as possible. Specimens should not be carried in the hands, because the heat of the body soon causes them to fade. Any sort of tin case will serve to carry them, but a vasculum designed for the purpose costs very little. The collector will take with him a pocket lens and a strong knife. It is desirable to show in the herbarium all parts of the plant—

flower, fruit, buds, leaves, stem, root-leaves, and root. Consequently, it will often be necessary to procure specimens of the same plant at different seasons. If it is too large for exhibition entire, its parts may be shown by a judicious choice of samples of the several portions.

On returning from a botanizing ramble, remove the spoils at once from the tin case, and dry them under pressure. For this purpose drying-paper is wanted. Blotting or other bibulous paper is best, but old newspapers form a cheap and efficient substitute. Take a specimen, clean it, free it from earth, and cut off withered leaves, etc. Lay it on a sheet of drying-paper, and spread it as flat as possible. Place another sheet of drying-paper above the plant, and lay the whole between two smooth, flat boards. Then put a weight on the top—a pile of books is as good as anything. Too heavy pressure is a mistake. Change the drying-papers from time to time, until all the moisture is expelled from the specimen. If the colours of flowers are to be preserved, it is necessary to use heat before they are

placed under pressure. Various methods are recommended. The most convenient is to pass a warm flat-iron gently over the blooms. Another plan is to imbed the flower in plaster of Paris, sprinkling the powder thickly over and into the spaces, and heat the mass at a temperature of 90° or 100° Fahr. for twelve hours in the case of small flowers, and longer in the case of large ones. Free the blossoms from the plaster with a camel's-hair brush, and carefully clean them with petroleum. In either case, after applying the heat, place the flower under pressure in the usual way.

When the specimen is dry, it should be mounted upon a sheet of stout white paper, foolscap size. It may be easily secured by thin strips of gummed paper laid over the stem at various points. Write upon the sheet the common and scientific names of the plant, the place and date of its finding, and any other points worthy to be noted. All the sheets containing the species of one genus should be enclosed in a folded sheet of brown paper. The whole herbarium may be kept in a set of store-boxes, as to the construction of which I shall have something to say

afterwards. When a genus is a large one, a store-box may be reserved for the sheets belonging to it. The collection must be laid aside in a dry place, for damp will speedily ruin it, and it will be all the better for a little camphor to keep away destructive insects.

I formerly remarked that birds' eggs can be well studied without collecting them. If, however, a collection is wished, its preparation must be set about in a regular manner. April, May, and June are the best months for collecting eggs, although nests are to be found both earlier and later. The requisites are a stout stick, with a crook to draw aside branches and foliage, several tin and chip boxes, and some paper and cotton-wool. When you remove an egg from the nest, handle it with delicacy, so as not to disturb the other eggs that are left. Hold it by the ends, not sideways. Wrap the egg first in cotton-wool, and then in paper, and place it in a chip box.

On returning home, the contents of the eggs must be at once extracted. There are two methods of doing this, but the first of these is now considered quite out of date,

and spoils the specimens. I shall, however, describe it, as it needs no apparatus.

First Method.—Make with a fine needle a little hole at the smaller end, and a less hole at the larger. Blow gently through the smaller hole. If the yolk be stiff, place the smaller end in a cup of clean water, apply your lips to the larger end, suck in a little water, shake the egg well, and then blow again.

Second Method.—Having provided yourself with egg-drills and blow-pipes, which are sold for a trifle by the dealers, hold the egg by the ends between the first finger and thumb of your left hand over a bowl full of water. If you grip it sideways it will probably break. Make a hole in one side with a fine needle, insert the point of a suitable drill, and twirl it rapidly between your finger and thumb, till you have formed a neat round hole. Place the blow-pipe to the edge of this hole, turning the egg over above the water, and blow out the contents. If stiff, blow a small quantity of water into the shell. In either case, after the egg has been emptied, wash out the shell by sucking or blowing water into it, and place

it on a piece of blotting-paper to dry. 'Hard-set' eggs are to be avoided, but one sometimes has to deal with these. If you suspect an egg to be in this condition, glue a narrow band of brown paper round the middle of it. When the glue is dry, drill a hole through both paper and shell. This process prevents the chipping or breaking of the shell. After the egg has been emptied, place it in warm water, and the paper will be easily removed. To make the paper adhere to the convex surface of the egg, a series of small slits should be cut in its edges before it is glued. The eggs may be preserved in a store-box, on pink or white cotton-wool, or on moss. The box should be divided by partitions into compartments, of which one ought to be assigned to each species of bird. I shall speak of this afterwards.

As regards collecting and preserving butterflies and moths, much minute information will be found in *The Lepidopterist's Guide*, by Dr. Knaggs (price 1s.; Gurney and Jackson, London), and as regards animals generally, in the Syllabus of Practical Taxidermy attached to *The Treasury of Natural*

History, by Samuel Maunders (price 10s.; Longmans, London). I shall here aim only at furnishing sufficient information to start any one in the business of forming a collection.

I shall begin with butterflies and moths. For the capture of these and all winged insects a light gauze net is essential. Such nets are to be procured in great variety. It is, however, no difficult task to construct a bag of leno, or book muslin (preferably green), to fit a hoop or ring ten or twelve inches in diameter. The bag should be twenty-five to thirty inches in depth. The hoop may be of cane, willow, brass wire, or any other pliable material. In an emergency I have extemporized one by cutting a stout stick and lashing a thin tough branch, bent in a hoop, to its point. A portable net is fashioned by procuring a tin socket, shaped like the letter 'Y,' the leg fitting a walking-stick, and the arms fitting the ends of a thin cane, which can be thrust through the hem of the net, and then inserted into these two sockets. A supply of chip boxes will be provided. A useful size is $1\frac{1}{2}$ inches across

180 NOTEBOOKS AND COLLECTIONS

and $\frac{3}{4}$ inch deep; but a number of smaller ones will also be required. It is advisable to number the boxes on the lid and bottom before starting, and to keep the empty ones separate from those which contain specimens.

On netting a butterfly or moth, slip into the net one of the boxes with the lid off, coax the specimen into it, and put on the lid. When the insect finds itself in the dark, it will not flutter. Powerful species, which might injure themselves by fluttering, will have to be killed by putting a few drops of benzine into the box. In this case, a small piece of soft paper will have to be placed over the insect in the box to prevent it being rubbed and damaged as you walk. Many collectors carry a corked collecting-box, and kill and pin their captures at once. I have always found that, with ordinary care, the chip boxes are equally efficient, and far more convenient. On arriving home, the insects may be killed by putting a few drops of benzine into the box, or may be transferred into a killing box. This can be constructed out of one of those small tin boxes fitted with tight lids, such as are used for many

purposes nowadays. Place a few layers of clean blotting-paper in the bottom, and pour half a dozen drops of benzine upon the blotting-paper. An insect placed in the box will be instantly killed. You may substitute cyanide of potassium, or bruised leaves and shoots of laurel, for the benzine, if you prefer these. I always use the more convenient and safer benzine.

The right use of the net is by no means easily acquired. All haste and excitement are to be avoided, and the stroke should be made if possible when the butterfly is settled upon a flower or other object. Special care must be taken in the vicinity of thorny or prickly plants, particularly brambles, as want of care will lead to the entanglement and destruction of the net.

The most remarkable experience I have had in the matter of netting a butterfly was the capture of a specimen of the Painted Lady (*Pyrameis cardui*). My brother and I observed the insect near an old tower in an open space amongst trees. It was so restless, that we could not approach it while settled, and when on the wing, it soared

too high for us to reach. After the manner of its kind, for the Painted Lady is one of the boldest butterflies, it returned again and again, repeatedly alighting on the white wall of the tower, or on a large boundary stone near it.

It occurred to me that, as I was wearing a light-coloured straw hat, the butterfly might perch on that, if I stood quite still. My brother placed himself under the shelter of a tree, to signal if the insect should alight, while I stood motionless close to the tower. I saw the Painted Lady pass behind me. I did not move.

Suddenly my brother exclaimed, 'There! It's on your hat!' I brought the net down smartly on the crown of my hat, and was lucky enough to enclose the prize. By taking off hat and net it was secured in safety.

The insect when quite dead must be set. Take its body delicately between the finger and thumb of your left hand, and with your right pass a long thin pin through the thorax (the thick part behind the head). See that the pin is inserted *straight*, and projects at

least half an inch *beneath the body*. Special pins are sold for the purpose, but any thin pin will suffice.

You must either purchase or make a setting-board. One may be made of a piece of soft wood of convenient length, 3 inches broad, $\frac{3}{4}$ -inch thick, and with a groove $\frac{1}{4}$ -inch wide and $\frac{1}{2}$ -inch deep ploughed down the centre. The groove should be made wider for stouter-bodied specimens. Its purpose is to ensure that the point of the pin will be at least half an inch below the outspread wings. Were it not for this, the insect might quite well be set on a flat piece of cork or wood; but then the pin would protrude only a short distance beyond the body, and the specimen, when placed in the collection, would rest on the bottom of the drawer or box, which is undesirable. Consequently, if you cannot get a grooved setting-board (as often happens when one is from home), a flat board may be used, provided you first bore a hole for each pin at least *half an inch deep*. Thus the point of the pin will be well into the board, when the wings rest horizontally upon it.

Returning to the operation of 'setting,' you take up the specimen by the head of the pin, and thrust the point firmly into the bottom of the groove or hole, as the case may be. Take two pieces of narrow silk tape, six inches long and one-eighth inch wide. Pin one end of each piece to the board, one on each side of, and touching, the central groove, in a straight line with the body of the insect. With a fine needle, inserted in a match-stalk or small piece of wood, gently separate the wings sufficiently to permit of your bringing back the *free ends* of the tape between them. Take care that one tape passes on one side, and the other on the other side of the pin. Use the needle to lightly fold the left-hand pair of wings flat upon the board, and tighten the left-hand tape so as to hold them there. Pin the free end of that tape to keep it in position. Repeat this operation with the right-hand pair of wings. You will then have all the wings under command. Adjust them with the needle until they lie neatly and symmetrically. The tapes are used to check their spring. When set to your mind, secure them with

small pieces of thin card or paper, pinned to the board with their points resting on the wings; but do not let any pin pass through the wings. Arrange the antennæ evenly in front. Then remove the tapes, which are only needed as a mild restraint during the process of setting; indeed, if the wings are not very stiff, the tapes may be dispensed with entirely. In a few days the specimen will be dry. Remove the pieces of card ('braces,' as they are called), and lift the specimen by the head of the pin. It may then be placed in the store-box or cabinet.

What I have said applies to the setting of butterflies, moths, dragon-flies, bees, saw-flies, and two-winged flies. In the case of those dragon-flies which are small and brittle, the body may be strengthened by pushing a thin bristle, or dry grass stem, through the underside of the thorax, between the legs, downwards through the abdomen. The spare portion will be cut off. The legs must be drawn neatly into position before the wings are set, and the long abdomen will be supported by means of crossed pins. In this case, take care that the benzine does not

tough the bodies, as it is apt to damage the colours. The central groove of the setting-board will have to be half an inch wide, to leave room for setting the legs.

As moths are mostly nocturnal in their habits, the collector seldom nets them. A few day-flying species may be taken on the wing, but, as a rule, other expedients have to be adopted. Rearing from the larvæ is one mode. Other methods are collecting pupæ, and attracting and capturing moths by means of a light, tree trunks smeared with a mixture of treacle and beer, ivy blossom, or (in some species) a decoy female. These are fully described in the books. The most interesting is rearing either from the egg or caterpillar—a process which only needs a little patience and experience.

Beetles and similar insects demand a different system, both of capturing and setting. The net required is a stout sweeping net of sheeting, on a strong wire ring at the end of of a stick. This is employed for brushing through grass and herbage to catch the beetles that lurk there. The butterfly-net, or an umbrella inverted, is of much use when

placed beneath branches while you beat with a stick, to dislodge concealed specimens. The chip boxes will serve to hold your captures. They also serve to catch beetles, if you hold the box open in front of the beetle, slip it in, and close the lid. A bottle fitted with a cork pierced with a quill is convenient for holding small beetles. Whether you adopt box or bottle, beware of confining together two species, unless you are sure that they are vegetarians. The enclosure of two carnivorous beetles means the destruction of one of them, and the damaging of the other.

So soon as the sun in Spring begins to shine with genial warmth, you may sally forth, tapping over your net or umbrella the branches of young trees, and searching sandpits for specimens which have struck the sides and fallen down. In Summer, you may dredge with a strong net the edges of ponds, and also under the banks of ditches and streams; brush the sweeping-net through patches of grass and wild flowers, look under stones and the bodies of dead animals, turn over heaps of vegetable refuse, and closely

examine ants' nests, and the trunks of trees where there is running sap.

When Summer gives place to Autumn, toadstools and fungi must receive attention, and you will hunt amongst dead leaves, and under the bark of decaying trees. Even in Winter there is work to be done. Tufts of dry grass and moss may be cut during open weather, and shaken over a sheet of newspaper. Many specimens may be also procured by turning over the bottom layer when a stack of hay or corn is taken down. There are beetles there as well as rats.

Beetles may be killed with benzine, as already explained, or by plunging them into perfectly boiling water. The latter method sounds cruel, but is not so, because death is absolutely instantaneous. When killed, beetles may be either 'pinned' or 'carded.'

In the first method, a pin is passed through the right-hand wing case, so as to project half an inch beyond the body. The pin point is then inserted in the groove or hole of the setting-board, the legs and antennæ are drawn into position with a bent needle, and the whole is secured by means of crossed pins till dry.

In the second method, first prepare a paste of gum tragacanth and clear gum arabic in a little water. The paste should be white, and so stiff that it will not pour out. Place the beetle on its back, and with a camel's-hair brush draw out its legs and antennæ. Put some of the paste on a stout card, lay the beetle on it, legs undermost, and with a bent needle or clean brush draw the hind limbs into position, as shown in Plate No. VIII. When all are drawn out—and this needs a light hand and a good temper—let the card stand till the specimen is dry. Then float the card in a basin of water till the beetle comes off. Take a clean card of suitable size, put some fresh gum on it, and place the beetle thereon. When dry, cut away any superfluous card, and secure the specimen in your collection by means of a thin pin run through the portion of the card behind the insect. Personally, I prefer 'carding' as a mode of preserving beetles. It avoids damaging the wing cases—a matter of moment in the case of beetles, which are distinguished from each other less by colour than by shape, sculpture, and markings.

190 NOTEBOOKS AND COLLECTIONS

Orthopterous insects — earwigs, cockroaches, grasshoppers, and locusts—are set after the fashion of beetles, except that, if pinned, the pin is inserted through the centre of the thorax. Only a few specimens can be ‘carded.’ Care must be taken to properly exhibit the legs. Grasshoppers and locusts are best set with the long hind legs drawn out straight. If you have more than one specimen of the winged sorts, one should be set with the wings expanded, another with the wings closed.

In determining species it is necessary, in many cases, to examine anatomical details. For this purpose a strong lens is required. It is advisable to learn to dissect the bodies of spare specimens. It is quite easy to do this, and full instructions are given in the books. When it is desired to examine the number and ramifications of the nervures in the wings of butterflies, without damaging the scales, these should be damped with benzine. A camel’s-hair brush charged with benzine is applied gently to the root of the wing next the body, and the spirit spreads rapidly over the surface. No rubbing must be used.

The benzine does not hurt the colours of butterflies or moths. While the wings are wet, it is easy to examine the neurulation by means of the lens.

For the preservation of specimens it is necessary to have either a cabinet with drawers, or a series of store-boxes. I think it is wise to begin with the latter, and continue with these until you form some idea of the probable size of your collection. Store-boxes may be purchased, or made.

To make one, buy a sheet of strawboard $\frac{1}{8}$ -inch thick, costing threepence, two sheets of white demy paper, a sheet of blue demy paper, and some glue and paste. The sheet of strawboard will measure about $25\frac{1}{2}$ inches by 19 inches. Mark off on the longest side a point dividing it into two parts, one 14 inches, the other $11\frac{1}{2}$ inches. Cut the sheet into two parts at this point. The larger portion will form the box; the smaller, the lid. Damp some of the white demy paper, and paste it smoothly over one side of the strawboard, and place it under a heavy weight until perfectly dry. Take the part intended for the box, and rule four lines on the side

192 NOTEBOOKS AND COLLECTIONS

opposite to the white paper, one parallel to each side and end, and $1\frac{1}{2}$ inches from the edge. These lines will cross each other so as to leave a square of $1\frac{1}{2}$ inches at each corner. Cut out those four little squares. Then *partially* cut into the strawboard, along the lines, and fold upwards so as to form the sides and ends of the box. Then take the portion for the lid. Reserve the side where it was separated from the other piece as the line of hinge, but on the opposite side, and at both ends, rule lines parallel to the side and ends an inch and five-twelfths from the edge. Cut out the corner squares, and fold as before. It will be observed in folding, that the white paper is the lining of the box, and must be kept *inwards*. The angles will next be secured by pieces of linen tape glued on the outside, and the lid will be attached to the box by a strip of broad linen tape glued in the same manner.

The finished box will be 16 inches long by 11 inches broad, and $1\frac{1}{2}$ inches deep, having a lid with deep sides and ends, to overlap the box and exclude dust. It is better not to fasten the corners of the lid

before the hinge is glued, in order that you may have an opportunity of fitting the overlapping parts as tightly as possible. Finish the whole neatly by pasting a broad strip of blue demy paper over the linen hinge and the back of the box, and also at each corner. The idea is to give the box the appearance of a book. The measurements which have been given are those of the largest box which one sheet of strawboard will make; but an alteration of the figures will enable you to construct a box of any smaller size you desire. For a herbarium a smaller size is more suitable.

If the purpose of the box is merely to store a collection of sheets containing dried wild-flowers and plants, it is unnecessary to do anything more to it. If it is to contain birds' eggs, it must be divided into compartments, and for the larger species must be made deeper. A sufficient number of strips of strawboard an inch and a quarter broad, and covered with white paper, will be cut into portions, some as long as the inside of the box, others corresponding to the width of it. By making cuts into these at

their points of intersection, notching each half an inch, they may be fitted together and laid into the box, thus dividing it into rectangular compartments of such size as may be appropriate. The dividing bars need not be glued down. A small quantity of white, or pink cotton-wool, will be laid in the bottom to form nests for the eggs in these compartments, *before* the dividing bars are inserted.

If the box is designed to hold insects secured by means of pins, it will be requisite to provide some material at the bottom, into which the points of the pins may be inserted. For this purpose nothing is better than sheet cork, glued firmly down, and covered with white paper. Some use sheets of German peat, but it is rough. An excellent substitute for cork is formed by a light frame of wooden rods, $\frac{3}{8}$ -inch square, made to fit round the inside of the bottom. On the upper and under sides of this frame stretch two sheets of stout paper, and when dry finish with white paper on the upper surface. The frame is then glued to the bottom, but raised by slips of wood about $\frac{3}{8}$ -inch thick, the intention being

that the point of the pin shall pass through the upper sheet of paper and then the lower, and be retained by the latter. The frame must not, therefore, rest upon the bottom, otherwise the pin point could not pass beyond the lower sheet. It is found that *two* sheets of paper, with an intervening space of $\frac{3}{8}$ -inch, hold the pins nearly as well as cork. If a hole widens and the pin slackens, it can be steadied by pasting a tiny patch of white adhesive paper over the hole. A small pill-box should be glued in one corner of every store-box, and filled with camphor or naphthalene to keep off insects. The three fatal enemies of a collection are dust, mites, and light.

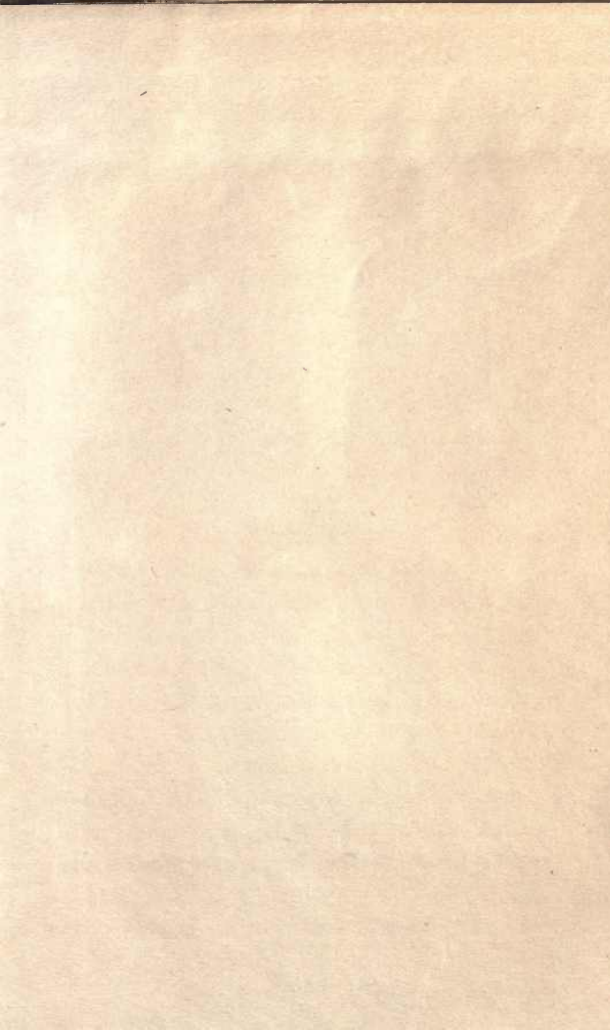
The reader, who has followed me thus far, has made the acquaintance of many objects which he is sure to meet, at one time or other, during his rambles afield in almost any part of the British Isles. He has also been shown how to record the result of his observations, and how to form and preserve a collection of specimens. At this point I shall stop. To expatiate upon the delights of Nature study would be unnecessary, if the

196 NOTEBOOKS AND COLLECTIONS

reader has a genuine love for Nature ; if he has not, it would be useless.

A reverend friend, from whose knowledge and experience I used to derive much assistance, was wont to repeat with satisfaction the remark of an old Scottish farmer, who excused his interest in such pursuits by saying, 'Deed, Doctor, it keeps a man frae becomin' dottled.' He meant that the interest aroused by watching the operations of Nature keeps at bay the dotage of advancing years. My old friend was himself a striking proof of the soundness of this principle, for he preserved the light of his intelligence bright and beneficent, until he was well into his ninth decade.

I shall take leave of the reader with these parting words of advice, which are extracted from the quaint old book called *Some Fruits of Solitude*, from which I have already quoted : 'It were happy if we studied Nature more in natural things, and acted according to Nature, whose rules are few, plain, and most reasonable. Let us begin where she begins, go her pace, and close always where she ends, and we cannot miss of being good Naturalists.'



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